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REFERENCES: From the Symposium, *Recent Concepts of Pain and Analgesia,* held in the Hall of States, American Hospital Association, Chicago, February 15, 1961: 1. Batterman, R. C.: *Non-Narcotic Analgesia in Ambulatory Patients.* 2. O'Dell, T. B.: *Experimental Parameters in the Evaluation of Analgesics.* 3. Miller, L. D.: *Distribution, Excretion and Metabolic Fate of Phenyramidol.* 4. Beisler, E.: *Preliminary Report of Experience with Phenyramidol for Dental Analgesia.* 5. Bader, G.: *Preliminary Report on the Use of Analexin for Dysmenorrhea in Telephone Operators.* 6. Taylor, S. L.: *Phenyramidol in General Hospital Orthopedics.* 7. Bodi, T.: *Pain Management Among Clinic Outpatients.* 8. Ramunis, J.: *Experience of an Industrial Surgeon with Phenyramidol.* 9. Kast, E. C.: *Methodological Considerations in the Clinical Evaluation of an Analgesic.* 10. Collopy, C. T.: *Preliminary Comparisons of Two Non-Narcotic Analgesic Agents in Hospitalized Orthopedic Patients.* 11. Cass, L. J.: *Report on the Analgesic and Calmative Effectiveness of Two Preparations on Patients with Acute and Chronic Pain.* 12. Lamphier, T. A.: *Intravenous Phenyramidol in the Management of Low Back Pain and Allied Disorders.* 13. O'Dell, T. B.: Chicago Med. *63*:9, 1961. 14. Kast, E. C.: Chicago Med. *63*:17, 1961. 15. Wainer, A. S.: J. Am. M. Women's A. *16*:218, 1961. 16. Batterman, R. C.: Ann. New York Acad. Sc. *86*:203, 1960. 17. O'Dell, T. B.: Ann. New York Acad. Sc. *86*:191, 1960. 18. O'Dell, T. B., *et al.:* J. Pharmacol. & Exper. Therap. *128*:65, 1960. 19. O'Dell, T. B., *et al.:* Fed. Proc. *18*:1694, 1959. 20. Gray, A. P., *et al.:* J. Am. Chem. Soc. *81*:4347, 1959. 21. Wainer, A. S.: Clin. Med. *7*:2331, 1960. 22. Clinical data in files of Medical Dept., Irwin, Neisler & Co., 1959. 23. Batterman, R. C., *et al.:* Am. J. Med. Sc. *238*:315, 1959.

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Journal of Occupational Medicine

ISSUE OF AUGUST 1961

Official Publication of the Industrial Medical Association

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Association Activities

By-Laws of the Industrial Medical Association

As Revised and Adopted at the Annual Meeting April 12, 1961

Article I—Name

The name and title of this organization shall be INDUSTRIAL MEDICAL ASSOCIATION.

Article II—Object

The object of this Association shall be to foster the study of the problems peculiar to the practice of industrial medicine and surgery, and to unite into one organization members of the medical profession whose interest lies in that field. It shall encourage the development of methods adapted to the conservation and improvement of health among workers, and promote a more general understanding of the purposes and results of the medical care of these workers.

Article III—Membership

SECTION 1—MEMBERSHIP in this Association shall be of six classes: (a) Fellow; (b) Active; (c) Associate; (d) Honorary; (e) Inactive; (f) Emeritus.

SECTION 2—FELLOWSHIP: Fellows shall be elected from persons who are Active Members and have been actively engaged in the practice of industrial medicine for at least five (5) years.

(a) At least once a year, the District Counselors, with the assistance of the officers of the respective component societies, shall review the roll of Active Members and make recommendations for Fellowship.

(b) Fellowship may be conferred by the Board of Directors upon those Active Members who have been properly indorsed by the Counselor and/or the president of the component society, and/ a member of the Board of Directors.

(c) The Board of Examiners shall consist of three (3) Fellows appointed by the President with the approval of the Board of Directors. The term of office of the Examiners shall be for a period of three (3) years with one (1) new appointee each year. The Board of Examiners shall evaluate the qualifications of Active Members proposed for Fellowship and make appropriate recommendations to the Board of Directors.

(d) Qualifications for Fellowship: An Active Member who has achieved distinction in the field of industrial medicine is eligible for Fellowship. In addition to the five (5) year requirement, the qualifications for Fellowship shall rest with the Board of Examiners.

(e) The Active Members recommended for Fellowship may be required to appear for examination at a time and place specified by the Board of Examiners in order that proper recommendations may be made to the Board of Directors.

(f) A suitable certificate will be issued by the Secretary to those upon whom Fellowship has been conferred. The Board of Directors shall be authorized to make available other desirable insignia of Fellowship.

SECTION 3—ACTIVE MEMBERSHIP: Active Members shall be doctors of medicine who are members of their local county medical societies and/or active members of the American Medical Association; or, where the applicant resides in a foreign country, of some corresponding association or society, and who have an interest in industrial medicine.

SECTION 4—ASSOCIATE MEMBERSHIP: Associate Members shall be doctors of medicine taking postgraduate work in industrial medicine, or interns and residents. The requirement of being a member of their local county medical society and/or of the American Medical Association may be waived for this classification of membership during their training program. Upon completion of their training they will automatically become Active Members provided the above requirements as to membership in their local county medical society and/or the American Association are met.

SECTION 5—HONORARY MEMBERSHIP: Honorary Membership shall be conferred upon those individuals not Members or Fellows of the Association who have contributed distinguished service to the objectives for which the Association stands, or have performed some special service for the Association.

SECTION 6—INACTIVE MEMBERSHIP: Inactive Membership status is provided for those Active Members or Fellows who are disabled and therefore must be relieved of some of their responsibilities and obligations. Each case must be acted upon and approved by the Executive Committee, and those approved for Inactive status will be relieved of paying dues for a period of twelve (12) months, during which time they will receive the official publication.

SECTION 7—EMERITUS MEMBERSHIP: Fellows and Active Members who have been members of this Association for ten (10) years or more, and who are Fellows or Active Members in good standing at the time of their retirement or are Inactive Members by virtue of disability, or have been Active Members for twenty (20) years or more and have reached the age of seventy (70), shall be eligible to Emeritus Membership. Each case must be acted upon and approved by the Executive Committee.

SECTION 8—Associate, Honorary, Inactive, and Emeritus Members shall have all the privileges of Active Members, except the privileges of holding office and voting.

SECTION 9—Application for Active or Associate Membership must be made in writing, and the applicant must be certified by the Secretary of the

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References: 1. Brown, E. A.: Antibiotic Med. & Clin. Ther. 6:412, 1959. 2. Feinberg, S. M.: Med. Sci. 6:(No. 3)181, 1959.

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time	amount	administration
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2nd day	two 0.75 mg. Tablets DECADRON	b.i.d.
3rd day	two 0.75 mg. Tablets DECADRON	b.i.d.
4th day	one 0.75 mg. Tablet DECADRON	b.i.d.
5th day	one 0.75 mg. Tablet DECADRON	per day
6th day	one 0.75 mg. Tablet DECADRON	per day
7th day	RETURN VISIT	

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applicant's local county medical society as a member in good standing thereof, or submit proof of membership in the American Medical Association, or, in case the applicant resides in a foreign country, submit proof of membership in some corresponding Association or Society. Application must be approved by:

(a) A Fellow or Active Member in good standing, and

(b) The Component Society in the locality in which applicant resides, if there be a Component Society in such locality, and

(c) A majority of the Membership Committee, provided, however, that

(1) In case of a disputed approval by a component society, the applicant has the right of appeal to the Board of Directors of the Association. The requirement of approval may be waived by action of the Board of Directors.

After approval, as aforesaid, the application on such Member may be accepted at a meeting of the Board of Directors, at which a quorum is present, by the favorable vote of two-thirds of the Directors present at such meeting.

Fellows and Honorary Members require no prior approval, but may be elected from time to time at a meeting of the Board of Directors at which a quorum is present by the favorable vote of two-thirds of the members present at such meeting.

Article IV—Officers and Directors

SECTION 1—The Officers of the Association shall be a President, a President-Elect, a First Vice-President, a Second Vice-President, a Secretary and a Treasurer.

The President shall hold no other office in this Association.

SECTION 2—The Board of Directors of the Association shall consist of the Officers and fifteen (15) elected Board members.

SECTION 3—The Officers of the Association shall constitute the Executive Committee of the Board of Directors.

SECTION 4—Only Fellows shall be eligible to serve on the Board of Directors or as Officers. Only Active Members or Fellows will have the right to vote for Officers and Directors.

Article V—Duties of Officers

SECTION 1—The President shall be the chief executive officer of the Association and, subject to the direction of the Board of Directors, shall have general administrative control of its affairs. He shall preside at all meetings of the Members and of the Board of Directors, and of the Executive Committee, and perform such other duties as from time to time may be directed by the Board of Directors. He shall be ex-officio a member of all committees. He shall have general power to execute bonds, deeds, and contracts in the name of the Association and shall have such other duties as may be conferred upon him by law, or these By-Laws, or the Board of Directors.

SECTION 2—The President-Elect shall assume all of the duties of the President in his absence.

SECTION 3—In the absence of the President and the President-Elect, the duties and responsibilities of the office shall devolve upon the First and Second Vice-Presidents, in that order.

SECTION 4—The Secretary shall keep an accurate record of all the transactions of all meetings of the Association and of the Board of Directors and of the Executive Committee, and shall keep a correct list of all Members of the Association and their addresses. He shall be responsible for sending all notices of meetings. He shall be in charge of the Association's seal.

SECTION 5—The Managing Director shall carry on the correspondence of the Association and the other business of the Association as delegated to him by the Board of Directors. He shall receive all moneys belonging to the Association, give a receipt therefor, and turn all money over to the custody of the Treasurer. He shall be paid a yearly salary, the amount to be determined by the Board of Directors.

SECTION 6—The Treasurer shall be the custodian of all moneys of the Association and shall pay all just bills against the Association subject to the approval of the Board of Directors. He shall submit his accounts, audited by a Certified Public Accountant, to the Board of Directors at the Annual Meeting, and shall transmit to his successor in office all funds and property of the Association remaining in his possession. He shall submit an annual report to the Association in such form as may be determined by the Board of Directors.

SECTION 7—Both the Managing Director and the Treasurer shall be bonded in such an amount as shall be determined by the Board of Directors from year to year and in a company approved by the Board of Directors. Expense of the bond shall be borne by the Association.

SECTION 8—The Board of Directors shall be responsible to the Membership of the Association for the administration of the affairs of the Association.

SECTION 9—The Executive Committee shall be responsible to the Board of Directors for the administration of the affairs of the Association between meetings of the Board of Directors.

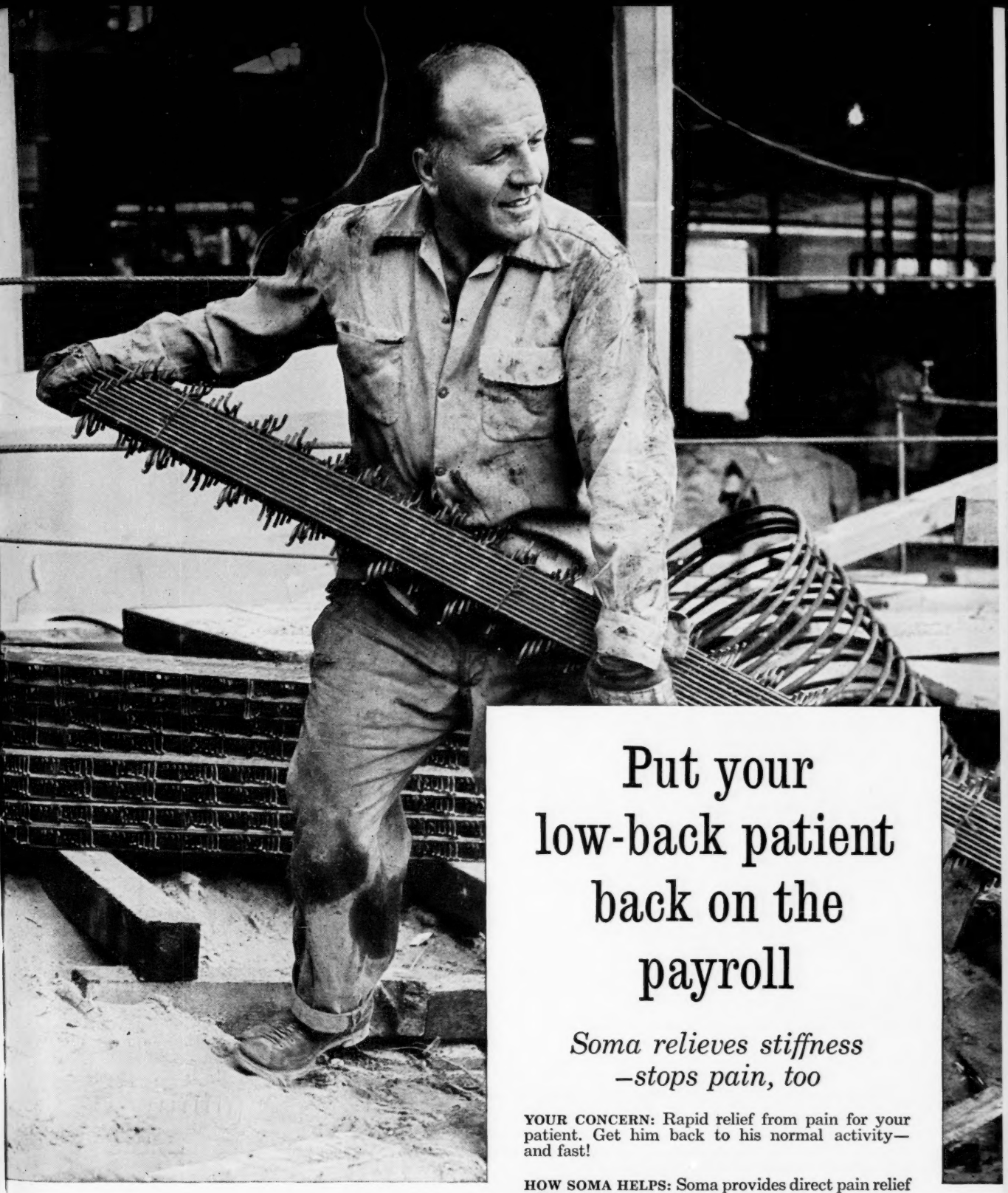
Article VI—Meetings of Members

SECTION 1—The Annual Meeting of the Association shall be held at the time and place designated by the Board of Directors.

SECTION 2—Special meetings may be called by the President, with the approval of a majority of the Executive Committee, at such time and place as may be designated in such call. Upon petition bearing the signature of fifty (50) or more Active Members or Fellows, the President shall call a meeting as specified above.

SECTION 3—Members having a right to vote shall be notified by the Managing Director at least thirty (30) days in advance of the date set for the meeting. This notice may be by individual notification or through the official publication.

SECTION 4—Quorum: Fifty (50) Members eli-



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gible to vote or represented by proxy shall constitute a quorum.

SECTION 5—The vote of a majority of the Members present in person or represented by proxy, having a right to vote, shall decide any question brought before such meeting, unless the question is one upon which by express provision of the statutes or of the Certificate of Incorporation or of these By-Laws, a different vote is required, in which case such express provision shall govern and control the decision of such question.

SECTION 6—At all meetings of Members, a majority of the Members present in person or by proxy may adjourn the meeting from time to time, but not for a period of more than thirty (30) days at any one time. At any such adjourned meeting, any business may be transacted which might have been transacted at the meeting as originally called. No notice of an adjourned meeting need be given.

Article VII—Meetings of the Board of Directors

SECTION 1—A regular meeting of the Board of Directors shall be held immediately before each annual meeting of the Members. Special meetings of the Board of Directors may be called by the President or by any five (5) Directors at such time and place as shall be designated in the call.

SECTION 2—Quorum: A majority of the Board of Directors shall constitute a quorum.

Article VIII—Election of Officers and Directors

SECTION 1—Within sixty (60) days following the Annual Meeting of the Members, the President shall appoint a Nominating Committee consisting of three (3) Fellows from the Membership at large and three (3) Presidents of Component Societies. The Nominating Committee shall nominate not less than two (2) Fellows for each vacancy on the Board of Directors—five (5) of whom shall be for a term of three (3) years, and shall also make nominations for any vacancies for unexpired terms which may need to be filled.

SECTION 2—The Board of Directors shall nominate one Fellow for each of the offices of President-Elect, First Vice-President, Second Vice-President, Secretary, and Treasurer.

SECTION 3—The Managing Director shall be appointed by the Board of Directors.

SECTION 4—The Nominating Committee shall furnish the Board of Directors their nominations at least three (3) months prior to the next annual meeting of the Members. The Managing Director shall have ballots printed with the nominations as recommended by the Board of Directors, and space will be allowed on the ballot for write-in votes for each office. The candidates receiving the greatest number of votes shall be elected.

SECTION 5—The President shall appoint Election Tellers from Fellows of the Association, none of whom shall be a candidate for any office.

SECTION 6—Ballots shall be mailed by the Managing Director to those Members and Fellows eligible to vote by virtue of a paid-up membership, not later than eight (8) weeks prior to the Annual Meeting. These ballots must be returned to the Managing Director's office not later than four (4) weeks prior to the time of the Annual Business Meeting in order to be counted.

SECTION 7—The President shall not cast a ballot except in case of a tie vote. The results shall be announced before the close of the Annual Meeting.

SECTION 8—The mail ballot shall provide for the election to the Board of Directors, five (5) Fellows to serve for a term of three (3) years, and other Fellows to serve as Directors to fill the unexpired terms when vacancies arise.

SECTION 9—All Officers and Directors of the Association, regardless of the term for which elected, shall hold office until their successors are elected and qualified.

Article IX—Vacancies

The Board of Directors shall have power to fill vacancies among the Officers and Directors to serve until the next Annual Meeting of the Association, or until their successors are elected and qualified.

Article X—Committees

SECTION 1—The President shall have the power to appoint such committees as he may deem necessary to conduct the affairs of the Association properly.

SECTION 2—Other Committees: The President shall appoint such other committees as may from time to time be designated by the Board of Directors.

SECTION 3—Term: All committees shall hold office from the time of their appointment to the close of the Annual Business Meeting.

Article XI—Dues

SECTION 1—The annual dues of Active Members shall be Thirty Dollars ($30.00) per year; of Fellows, Thirty-Five Dollars ($35.00) per year; and of Associate Members, Fifteen Dollars ($15.00) per year. Honorary Members and Emeritus Members shall pay no dues. Such part of the dues of Component Society Members may be allotted to the respective Component Societies as may be from time to time determined by the Board of Directors.

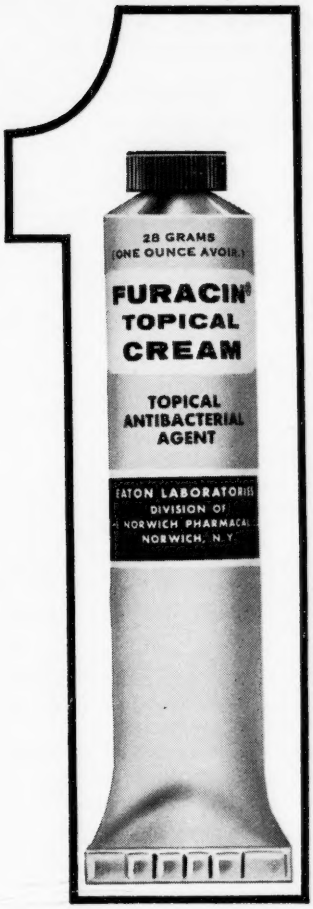
SECTION 2—Any Member whose dues for a current year are unpaid by April 30 may be considered delinquent and may be automatically dropped from Membership.

SECTION 3—Any Member dropped for non-payment of dues may be reinstated at any time previous to the convening of the Annual Meeting of the year following his delinquency by payment of dues in arrears and also dues for the current year.

Article XII—Component Societies

SECTION 1—The Board of Directors shall have the power to take the necessary steps for organizing or admitting Component Societies.

SECTION 2—A local or regional organization of Industrial Physicians and Surgeons already established by virtue of geographical location, mutual



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interests, and other necessary considerations, may become a Component Society and its Members admitted to Membership in this Association by making application to the Board of Directors through the District Counselor with a certification from their President and Secretary that their members meet all of the requirements for Membership. Dues per Member for current fiscal year and a copy of Constitution and By-Laws must accompany application.

SECTION 3—It is recommended that all Members carry their Membership through a Component Society when feasible and practical, as outlined in Section 2. A Fellow or a Member may be carried as a Direct Member upon recommendation of the District Counselor or approval by the Board of Directors.

Article XIII—District Counselors

SECTION 1—The President shall appoint District Counselors and instruct them as to their duties and responsibilities.

SECTION 2—The term of office of the District Counselor shall be for one (1) year and shall expire at the close of the Annual Meeting.

Article XIV—Expulsion

SECTION 1—A Fellow or Member may be expelled for such cause as the Board of Directors may deem sufficient; provided that a copy of the charge made against him shall be furnished to him in writing at least thirty (30) days before the meeting at which such action is taken. A three-fourths vote of all Members of the Board of Directors expressed in meeting of the Board or in writing shall be required to expel a Member of the Association.

Article XV—Amendments

SECTION 1—These By-Laws may be amended by a two-thirds vote of the Members entitled to vote, present in person or by proxy, at any Annual Meeting of the Association; provided that notice of proposed amendments (in addition to the notice required by these By-Laws for such meeting) must be given by publication in the Official Journal of the Association at least thirty (30) days before the date set for the meeting.

SECTION 2—When a majority of the Board of Directors or two-thirds of the Executive Committee have certified in writing delivered to the Secretary that the holding of any Annual Meeting is inadvisable, such Annual Meeting shall not be held. In such case, the Board of Directors may submit by mail to the Members of the Association having the right to vote, any question or action, including amendment of these By-Laws, but not including any question or action required by statute, or the Certificate of Incorporation, to be taken at a meeting. Such submission shall be made by ballots mailed to each Fellow and Active Member setting forth the action proposed and, in case of election of Directors and Officers, the names of the persons nominated. Only ballots returned within thirty (30) days after the mailing thereof shall be counted. In case of any proposed action, if a majority of the ballots is in favor thereof, such action shall be considered as adopted by the Members the same as if adopted at the Annual Meeting of the Members. The Directors and Officers receiving the majority vote on such ballots, whether or not those nominated, shall be deemed elected to the same effect as if elected at the Annual Meeting of the Members.

Article XVI—Miscellaneous

SECTION 1—Seal: The corporate seal shall have inscribed on it the name of the Association and the words "Corporate Seal, Illinois."

SECTION 2—The Fiscal year of the Association shall be from September 1 to August 31.

SECTION 3—Checks, etc.: No person shall have authority to sign checks, drafts or orders for the payment of money, or notes or acceptances unless specifically authorized by resolution by the Board of Directors.

SECTION 4—Notice: Except as otherwise provided by statute, notice when required to be given to any Director, Officer, or Member, shall not be construed to be personal notice or notice in any particular manner, but such notice may be given either by personal delivery to the Director, Officer, or Member, or by depositing the same in the United States Post Office or letter-box, in a postpaid, sealed wrapper, addressed to such Director, Officer, or Member at such address as appears on the books of the Association, or, in default of other address, to such person with no other address than Chicago, Illinois. Notice shall be deemed to be given when and if mailed. All notices must be in writing, but may be typewritten or printed in whole or in part.

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Journal of Occupational Medicine

PATCH TESTING in Dermatitis from the Newer Resins

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IN DECIDING whether a contact dermatitis is due to an allergen or to a primary irritant, the dermatologist is guided by history of onset and recurrence, reputation of the contactant, and patch test reaction to a nonirritating concentration of the contactant. The gross and microscopic morphology of the lesions are essentially the same and rarely are of practical help in differentiating between the two processes.

This is no less true of those dermatoses being reported from the newer resins, which include the epoxies, polyesters, and polyurethanes. Previous investigators[1-7] have contributed to our knowledge of patch testing with certain of these newer resins. The growth of the plastics industry is so great, however, that any list of patch test components soon becomes outdated. For its temporary value, the Division of Occupational Health of the Public Health Service has developed patch test concentrations for several of the newer resins and their catalysts. These patch test concentrations were developed not only as a guide for the investigation of occupational dermatoses by the Public Health Service but also as fulfillment of the requests of private dermatologists and industrial physicians.

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Animal Studies

Twenty-five resin components were screened for irritancy by placing 100%, 10%, 1%, and 0.1% concentrations in nonirritating solvents in open and closed patch tests on the shaved backs of male albino rabbits. One rabbit was used for each component. Occasionally, further dilution was necessary to find one that was nonirritating. In predicting irritation, pH readings as determined by a Beckman pH meter or indicator papers were additional aids.

Human Studies

The next step was application for 24 hours of closed patch tests on human volunteers, using the concentrations which had been nonirritating to rabbits. As a precautionary measure, each chemical was applied initially to two volunteers and the effect observed before the remainder of the 20 volunteers in each component group were tested. Ideally, 200 or 300 tests should have been made for each component, but this was not practicable. The likely maximum rate of positive reactions which could occur in a large number of tests is 14%, based on no reaction in a sample of 20 subjects.[8] The 119 volunteers participating in the tests were laboratory personnel and college students, ranging in age from 17 to 50 years. Eleven percent were females. Four percent were Negroes.

Patch tests were read at 24, 48, and 72 hours, and 2 weeks after application. Of the more than 600 patch tests applied, only 3 elicited observable reactions, all of them to tertiary

Table I—Recommended Patch Test Concentrations

Epoxy Resin Components	
1. Epon* 828 (low molecular weight epoxy resin)	1% MEK
2. Araldite† 502 (low molecular weight epoxy resin)	0.1% acet.
3. Epon* 1001 (high molecular weight epoxy resin)	10% acet.
4. Araldite† 6060 (high molecular weight epoxy resin)	10% acet.
5. Diethylenetriamine (aliphatic polyamine hardener)	0.05% aq.
6. Triethylenetetramine (aliphatic polyamine hardener)	0.1 % aq.
7. Metaphenylenediamine (aromatic amine hardener)	10% aq.
8. Versamid‡ 115 (polyamide resin hardener)	1% alc.
9. Phthalic anhydride	1% alc.
10. Maleic anhydride	1% aq.
Epoxy Resin Modifiers	
11. Furane§ resin X-2	0.05% MEK
12. Furane§ acid catalyst Z-1-A	0.05% aq.
13. Thiokol‖ liquid polymer LP-3 (polysulfide liquid polymer)	1% acet.
Polyester Resin Components	
14. Polyester monomer	10% acet.
15. Styrene	1% o.o.
16. Dimethyl aniline (percutaneous absorption may produce systemic effects)	10% alc.
17. Benzoyl peroxide	0.1% styrene and o.o.
Polyurethane Resin Components	
18. Rigithane‖ 112 (resin prepolymer)	1% alc.
19. Rigithane‖ catalyst C-112-R2	10% aq.
20. Solithane‖ 113 (resin prepolymer)	1% alc.
21. Solithane‖ catalyst C-113-300 (tertiary amine catalyst)	1% alc.
22. Solithane‖ catalyst C-113-328 (tertiary amine catalyst)	<10% aq.
23. Diethylethanolamine (tertiary amine catalyst)	<0.05% aq.
24. Methyl morpholine (tertiary amine catalyst)	0.1% aq.
25. Triethylenediamine (tertiary amine catalyst)	<0.1% aq.

Explanation of abbreviations: acet. = acetone; alc. = alcohol; aq. = aqueous; c.o. = castor oil; MEK = methyl ethyl ketone; o.o. = olive oil; pet. = petrolatum.

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†Ciba Products Corp., Fair Lawn, N.J.
‡Chemical Division, General Mills, Inc., Kankakee, Ill.
§Furane Plastics, Inc., Los Angeles 39, Calif.
‖Thiokol Chemical Corp., Trenton 7, N.J.

amine catalysts used in polyurethane foam production. Recommended patch test concentrations, based on the animal and human studies, are listed in Table I. In Table II, the concentrations of the epoxy resin components are compared to the patch test concentrations used by other investigators.[1-7]

In addition to knowing recommended patch test concentrations, it would be helpful for a dermatologist investigating an outbreak of dermatitis from resins to know how each of the components affects the skin and how the components are combined to form the cured resin. In the following descriptions of processes, comment will be made on the likelihood of components' sensitization or irritation of the workers' skin.

Epoxy Resins[9-13]

The combination of components used in curing epoxy resins is summarized in Table III. Contact dermatitis is common in the mixing, pouring, or laminating of epoxy resins and is most frequently caused by primary irritation from the amine hardeners or curing agents, which are also potent sensitizers. Anhydride curing agents are weak irritants and sensitizers. Liquid epoxy resins are moderate irritants and sensitizers. The solid epoxy resins are practically nonirritating but are weak sensitizers. The cured resins are usually inert, unless unreacted components such as amines are released by sawing, drilling, or sanding.

Epoxy resins may be modified with other resins for improved characteristics. Modifiers include polyamides, amino resins, phenolic resins furanes, and polysulfide liquid polymers. In addition to the dermatitis from the epoxy resins and hardeners, the dermatitis potential of the modifiers must also be considered. Polyamides and polysulfide liquid polymer were weak primary irritants on rabbits, but there are no reports of contact dermatitis from these agents. Uncured amino and phenolic resins and uncured furanes can produce either irritant or allergic contact dermatitis.

Less irritating curing agents have been developed for epoxy resins. These include polyamides, a hydroalkyl substituted aliphatic poly-

Table II—Patch Test Concentrations for Epoxy Resin Components According to Various Investigators

Epoxy Resins	Amine Hardeners	Investigators
20% c.o.	20% c.o.	Savitt[1]
50%-70% acet.	0.25%-10% alc. and other diluents	Malten[2]
1% o.o.	1%. o.o.	Gaul[3]
0.01%-0.1%	0.1%	Hine and others[4]
10% liquid pet.	10% liquid pet.	Lea, Block, and Cornish[5]
50% acet.	0.1% acet.	Blaney[6]
1%	1%	Fisher[7]
1%-10% acet.	0.05%-10% aq.	Key, Perone, and Birmingham

Explanation of abbreviations: acet. = acetone; alc. = alcohol; aq. = aqueous; c.o. = castor oil; MEK = methyl ethyl ketone; o.o. =olive oil; pet. =petrolatum.

Table III—Epoxy Resin Components

Lower Molecular Weight Epoxy Resins	Higher Molecular Weight Epoxy Resins
Liquids	Solids
Used without solvents	Used with solvents: ketones, aromatic or aliphatic hydrocarbons
Used for casting, potting, laminating, adhesives, dies, and models	Used for coatings
Cured by aliphatic or aromatic amines	Cured by acid anhydrides
Irritating properties inverse to molecular weight	Little or no dermatitis-producing potentialities

amine, acrylonitrile-amine adducts, and aliphatic amine adducts. Other components of epoxy resins are plasticizers, such as dibutyl phthalate and tricresyl phosphate, and reactive diluents, such as phenyl glycidyl ether, allyl glycidyl ether, butyl glycidyl ether, styrene oxide, acetonitrile, xylene, styrene, and aliphatic diepoxide, many of which are irritants and sensitizers. An epoxy resin may also contain unreacted epichlorohydrin, an irritant and sensitizer.

Polyester Resins[13–16]

Unsaturated polyesters are widely used for reinforced plastics. The polyester monomer is modified with either styrene or methyl methacrylate, and the copolymerization is catalyzed by organic peroxides which are frequently compounded in plasticizers to reduce their explosiveness and flammability (Table IV). Accelerators or promotors are used to facilitate low temperature cures. Standard polyester resin, in addition to polyester and styrene monomers, also contains small amounts of maleic and phthalic anhydride, propylene glycol, tertiary butyl catechol, and hydroquinone. The glass fiber used to reinforce polyester resins is chemically inert but physically irritates the skin with its sharp spicules. Dermatitis is occasionally encountered in polyester compounding and is usually caused by primary irritation by the components, all of which are primary irritants. Allergic hypersensitivity has been reported from polyester monomer, styrene, cobalt naphthenate, benzoyl peroxide, cyclohexanone peroxide, methyl ethyl ketone peroxide, tricresyl phosphate, and dibutyl phthalate.

Polyurethane Resins[13, 17, 18, 19]

Polyurethane or isocyanate resins find their main use in rigid, semirigid, and flexible foams, but are also used for coatings and adhesives. Polyurethane resins are made by reacting a diisocyanate, usually toluene diisocyanate or diphenylmethane diisocyanate, with polyols, such as glycols, polyesters, or polyethers. A prepolymer is a partially reacted mixture of polyester resin and diisocyanate. The catalyst employed in this reaction may be an organotin, cobalt naphthenate, or a tertiary amine, such as diethylethanolamine, methyl morpholine, ethyl morpholine, and triethylenediamine. Some of the tertiary amines are highly alkaline and irritating to the skin, but dermatitis in polyurethane production is rare. This is probably due to the precautions that are taken to prevent pulmonary irritation and sensitization from toluene diisocyanate, which may also irritate and sensitize the skin.

Comment

Although some of the cases of occupational dermatitis from handling the newer resins have been based on allergic hypersensitivity, the majority of the cases have been due to contact with primary irritants, such as the amines, and/or to repeated contact with low-grade irritants such as solvents and abrasive cleansers. Low-grade irritation is frequently confused with allergic hypersensitivity because both have delayed onsets. It is hoped that this reasonably current list of patch test concentrations not only will aid in separating allergic hypersensitivity from primary and low-grade irritation but also will help to prevent injury to the patient from irritant patch tests.

Summary

Contact dermatitis occurs frequently from epoxy resin components, occasionally from polyester resin components, and rarely from polyurethane resin components. As a diagnostic aid in distinguishing between allergic and primary irritant dermatitis, the Division of Occupational Health of the U. S. Public Health Service has recommended nonirritating patch testing concentrations and diluents for com-

Table IV—Polyester Resin Components

Catalysts	Plasticizers	Accelerators
Methyl ethyl ketone peroxide	Tricresyl phosphate	Cobalt naphthenate
Cumene hydroperoxide	Dibutyl phthalate	Manganese naphthenate
Benzoyl peroxide		Diethyl aniline
Lauroyl peroxide		Dimethyl aniline
2,4-Dichlorobenzoyl peroxide		Quaternary amines
p-Chlorobenzoyl peroxide		Dodecyl mercaptan
Succinic acid peroxide		Mercaptoethanol
Hydroxyheptyl peroxide		
Di-*t*-butyl diperphthalate		
t-Butyl perbenzoate		
t-Butyl hydroperoxide		

ponents of epoxy, polyester, and polyurethane resins. These concentrations were derived by first patch testing rabbits and later, 20 human volunteers for each resin component.

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1961 Symposium on Mental Health in Business and Industry

will be presented at the

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This symposium which was originally to have been held in May has been rescheduled for October. It is designed for physicians working in business and industry. The subjects to be covered include (1) the fundamentals of psychiatric knowledge affecting the practice of occupational medicine; (2) the importance of motivation of behavior; (3) the development of personality; (4) psychological methods by which people often ineffectively solve their problems; (5) the impact of social relationships, and (6) the recognition and management of emotional problems requiring "first aid."

Participants will be divided into small groups of not more than seven or eight to afford the best opportunity for individual participation. There will be case presentations, discussion of frequent problems occurring in the job situation, and instruction in significance of psychological testing procedures.

An opportunity will be provided for registrants to see first-hand the many stages in the course of a patient's stay in the hospital from the time of admission to the time of discharge. The faculty will include psychiatrists, psychologists, and other experts in the field of behavioral sciences from the senior staff of the Institute of Living and from other centers.

Enrollment fee is $350.00. Requests for further information may be sent to D. W. Caldwell, M.D., P.O. Box 45, Linden, N. J.

Mental Health in Industrial Practice

I. MENTAL HYGIENE AMONG EMPLOYEES

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EMOTIONAL illness is encountered by the industrial physician in a number of disguises. There are patients with physical manifestations of emotional illness—psychophysiological reactions. They rationalize that their symptoms are due to organic illness, and if the physician is preoccupied exclusively with the physical he inadvertently encourages their rationalization. There are patients with hypochondriacal reactions, who displace their anxiety from their emotional problems to their physical health. Their symptoms are more vague and diffuse than the psychophysiologic reactions of patients who complain of abdominal pain, bloating, diarrhea, headaches, or palpitation.

Emotional tension does not always appear in the disguise of physical symptoms. Depressions, for instance, may be very difficult to diagnose in patients who cover them by overeating or overdrinking. And there are other patients who may minimize a complaint to the physician, attributing their symptoms to "nerves," in order to obtain his reassurance that they have no serious organic illness. The mechanism of denial is the opposite side of the coin from the rationalized psychophysiological reaction, and it may cause the physician to overlook an organic diagnosis.

In some form or other, emotional illness is an unavoidable problem in the administration of a group medical program, and the industrial physician should be prepared to meet it. This paper will deal with the broad themes of what a medical department's basic philosophy should be; the basic requirements of the nonpsychiatric physician for handling many psychiatric problems; and certain fundamental causes of emotional problems.

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Orientation of the Medical Department

The medical department's basic philosophy must be oriented toward total health. This outlook will permeate the entire company and establish good mental hygiene principles everywhere—in the relationship of the supervisor with his men, and in the relationship of one employee to another.

Often opposition to mental health programs and psychiatric approaches to problems comes from the nonpsychiatric physician unable to accept psychiatry. This is seen at times both in industry and out of industry, and it has possibly been the greatest cause of delay in research in mental illness and in the application of the knowledge discovered through basic and clinical research. A physician's resistance to psychiatry may come from many sources—his fear of mental illness in himself or his family, unpleasant associations with workers in the psychiatric field, personal problems of an emotional nature which he does not want exposed or inspected, or perhaps lack of knowledge of psychiatric principles and therefore lack of faith in their applicability. Freud's atheistic personal philosophy and the fact that he was rejected by the medical profession of his day contribute greatly to resistances which exist even in our time.

Yet the need for workers in the mental health field and the need for research are almost beyond comprehension. From a rational point of view, why we should discourage work in this area or hesitate to accept new developments is difficult to understand.

When the company's medical department and its executives are oriented toward good health, both mental and physical, each employee will become aware of good mental hygiene in his company and then be quick to seek counsel if he thinks he is getting into trouble emotionally. Usually he is not much more hesitant to talk about his emotional difficulties than about a dermatitis which he has developed, if company policy encourages this attitude. If the

medical department is receptive, the employees will keep their eyes open for problems everywhere and encourage fellow employees to seek help and direction from the medical department regarding problems not limited simply to physical health.

Requirements of the Physician

In detecting and solving the beginning emotional problem, the ability to make a positive diagnosis of emotional illness is important; not simply diagnosis by exclusion of everything else, but diagnosis on the basis of positive findings. The physician in industry, whether he be general practitioner, internist, or surgeon, has no difficulty diagnosing any physical illness and doing it very early. He can develop the same ability with emotional disorders. If he has been out of medical school several years, it is possible that he was given very little psychiatric training in medical school or during his internship and residency. This is beginning to change now. Many new physicians in nonpsychiatric specialties have had considerable training in the psychiatric field and know essential diagnosis and a great deal about psychotherapy. There are many other physicians who have been out of school many, many years but through their own study and attendance in postgraduate courses have developed tremendous facility in the psychiatric field.

The physician must know psychodynamics—this is, motivation. The term psychodynamics could be compared with the term pathologic physiology, used often by the physician. It is concerned with understanding the motives of human behavior. When a patient confronts the physician with his problem, he must seek to find the conscious and unconscious determinants of the patient's words and actions. He must know mental mechanisms (mechanisms of defense) such as projection, rationalization, denial, repression, suppression, sublimation, and many others. Most physicians are familiar with these.

The physician must have some knowledge of the organization of the personality. It does not make too much difference whether he thinks completely in terms of the conscious, preconscious, and unconscious, but he should have some feeling and understanding about levels of awareness and how a person's actions are determined emotionally as well as rationally. Again it does not matter whether he uses the Freudian terms id, ego, and superego, but he must have some understanding of basic biological drives and how the individual controls these through his rational, reasoning self, and through the help of his conscience. It is not difficult to know something about the unconscious activity of a person, and much can be got through dream interpretation. Dreams represent fears and wishes, and often the meaning is crystal clear. Some meaningful information is obtained just by learning that the dreams are bad, and frightening, or that they are good and happy dreams. One does not have to be a Freudian analyst to use this knowledge. In fact much of it existed and was understood by physicians and laymen long before Freud.

Two recent books helpful in the general area of understanding human behavior and diagnosing emotional disorders are those by O. Spurgeon English and Gerald H. J. Pearson,[1] English and Stuart M. Finch.[2]

The physician must develop a good interview technique which is psychiatrically oriented. He should be more than a kind listener. He should skillfully abstract the feeling and the emotional content from the patient's statements, calmly reflecting these back to him, in this way initiating a dynamic process which allows further discussion of deep emotional feelings and meaningful personal problems. A frank but tactful introduction of certain sensitive subjects is the responsibility of the physician. If the physician mentions such a subject, the patient feels, "This is something that can be discussed." Significant areas such as work, sexual and marital history, family, and educational background should be explored. The patient may bring up only one of these areas, and the physician then must open the discusion of others.

In interviewing, one should always be aware of some simple findings growing out of the classical experiments at the Hawthorne (Chicago) Plant of the Western Electric Company from 1927 to 1932. The investigators, after interviewing some 20,000 employees, reported two discoveries, both significant although elementary knowledge to anyone with clinical training: (1) The complaint, as stated, was frequently not the real source of the individual's difficulty. Consequently, action based on the contents of the complaint as presented by the employee did not assure that the underlying difficulty would be eliminated. (2) With the opportunity to express themselves freely, however, the employees were able to formulate more clearly their complaints, and in many cases the complaints disappeared entirely. The employee did not seem to have much trouble pushing aside the complaint which he brought in as the "presenting symptom," and fairly rapidly came to the real problem.

The physician must be aware of the subtle-

ties of the doctor-patient relationship. A major factor in the treatment of any illness is the relationship which exists between the physician and the patient. Psychiatry has made a major contribution in this area and repeatedly calls to the attention of the physician the use of himself as an instrument of therapy. The doctor-patient relationship is a dynamic interaction between two persons which is changing constantly and may not always be recognized as changing by either patient or doctor. Szasz and Hollender have described three basic models of physician-patient relationship which we are borrowing in this presentation.[3]

The first model described is the activity-passivity type. Here the physician does something to the patient who is the passive recipient. This type of relationship appeals to many of us. We like to do something tangible for the patient, and often the patient demands this either implicitly or explicitly. The prototype of this model is in the parent-infant relationship.

The second model is the guidance-cooperation type. The physician tells the patient what to do, and the patient cooperates and turns over a certain amount of power and authority to the doctor. This type underlies much of medical practice. The prototype of this model is in the parent-child (adolescent) relationship.

The third and final model is that of mutual participation in which the physician helps the patient to help himself. The prototype of this model is in the adult-adult relationship. The clinical application of this model is found in many of the chronic medical illnesses, psychiatric and psychosomatic disorders. Many of the health problems of industrial medicine lend themselves to this type of doctor-patient relationship. Psychoanalytically oriented psychotherapy is an excellent example of mutual participation. The physician is able to identify with the patient as a human being, yet in this partnership both maintain and appreciate the distinct individuality of the observer and the observed. The patient's own experiences provide reliable and important clues for therapy, and often the treatment program is carried out principally by the patient.

One of the most important factors in the success or failure of any treatment is an understanding of transference and counter-transference. Among the most important of the unconscious motivations which govern the patient's statements and behavior are the patient's attitudes and feelings toward the physician. Basically, then, the transference refers to the tendency of the patient to distort the role of the physician. These unconscious attitudes toward the doctor are based upon experiences with significant persons in the past. Thus without knowledge of the patient, the past is distorting his current behavior and interfering with his abilities to adjust to present reality. Unconsciously he may see the doctor in any one of several roles: someone who is going to take care of all his needs; a stern parent or authoritarian figure; a love object who becomes the recipient of unconscious sexual feelings; or a sibling. These unconscious attitudes can enhance or block therapy.

A patient struggling with intense sexual or hostile feelings of which he is unaware may solve the problem by running away from treatment or provoking the doctor so that he is dismissed or referred to another physician. (The term transference does not refer to reactions of the patient to the physician that are based on reality factors in the therapeutic relationship.)

An example of one aspect of the transference is the often observed phenomenon of a patient's feeling better as soon as he sees the physician. The patient knows that the physician possesses knowledge that he does not have and that he needs, and he turns to the physician as healer and comforter. The patient feels better also because of the transference reaction. The patient looks to the physician as he looked to his parents when he was a child. This phenomenon is succinctly described by Leo Tolstoi in *War and Peace*:

> They [the doctors] satisfied that eternal human need for hope of relief, for sympathy, and that something should be done, which is felt by those who are suffering. They satisfied the need seen in its most elementary form in a child, when it wants to have a place rubbed that has been hurt. A child knocks itself and runs at once to the arms of its mother or nurse to have the aching spot rubbed or kissed, and it feels better when it is done. The child cannot believe that the strongest and wisest of its people has no remedy for its pain, and the hope of relief and the expression of its mother's sympathy while she rubs the bump, comforts it."[4]

Counter-transference is involved in the physician's feelings toward the patient and refers to the tendency of the physician to distort the role of the patient. If the physician is aware of how patients often produce in him all kinds of over-reactions, whether they be positive or negative, he will more frequently remain in control of the situation. He should ask himself in regard to every patient: "Is what I am doing, or about to do, or about to suggest, for the patient really in the best interest of the patient, or for my own self-interest or for the fulfillment of certain of my my needs of which I am or am not aware?"

Causes of Emotional Problems

Jules H. Masserman, Professor of Psychiatry and Neurology, Northwestern University, in his vast research studies with animals and humans has demonstrated that nearly all forms of neurosis can be brought on by exposing an animal or human subject to important but apparently insoluble problems. The neurotic's reaction disappears when they are solved. Masserman has widely discussed the causes of breakdown in both medical journals and the popular press. An example of one of his articles for laymen was that published in *This Week Magazine*.[5] He stressed three causes which are highly applicable to our discussion:

1. A person's sense of adequate control may break down when his assigned tasks exceed his learning or his skill, or when his previously developed capacities are reduced by disease, injury, or age.

In a time of pyramiding technologies and lagging education, we can expect considerable trouble in this area. Also involved here are the declining physical resources of the average compulsive personality. This person has maintained his emotional balance by very orderly, ritualistic behavior. Often this behavior has required the expenditure of considerable energy, but since he had an abundance of energy his work efficiency was never cut down. Now with declining strength, and a job which requires the same amount of effort or even more, and a personality which has become not less, but possibly more, ritualistic, such a patient may be in serious difficulty. One frequently sees this type of employee in an accounting department. His perfectionistic, ritualistic tendencies are often accompanied by a tendency toward depressive episodes or even chronic depression and anxiety. This patient can often be helped by reassurance, insight into his basic personality organization, and by tailoring his work in such a way that it does not exhaust him. He cannot give up his compulsive pattern, and the physician should not try to make him do this. The physician should seek to strengthen these patterns which by now may be falling apart, contributing to his anxiety.

2. There is a genuine threat felt by every human being whenever those on whom he feels he must depend seem to desert him. This can be in one's home life, in leisure-time activity, in school, and in the work situation. Separation anxiety, a threat of rejection, the possibility of abandonment are real phenomena which plague every individual periodically in his life from birth until death.

3. Every person seeks for a sense of confidence and belongingness in some political, philosophic, or religious system; and when deeply cherished beliefs are threatened, the universe for a time turns bleak and terrifying. When they are restored, hope and serenity reappear.

Emotional disorders arising from the three sources of stress are treated by relieving or removing these sources and by helping the person regain a sense of physical competence, to rebuild his familiar relationships and personal friendships, and to reestablish the belief system or religious faith necessary to every civilized human being.

A statement by Ross points up a challenge which physicians in industry cannot avoid: "There is no question as to whether an industrial physician will or will not deal with emotional and social problems and factors. There are only questions as to whether he will deal with these effectively or not, and whether he will or will not make use of currently available attitudes, techniques and knowledge toward the more effective dealing with such problems and factors."[6]

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Convulsive Disorders in a Working Population

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IN RECENT years, the employment of the epileptic has been a subject of interest in the field of occupational medicine. Lennox and Cobb[1] collected data from a group of 1,105 clinic patients with epilepsy, 18 years of age and over, and found 73% employed. In most cases, the employers were unaware of the condition of epilepsy. College students, professional men, and business men formed 27% of the group; clerical and skilled workers, 28%; sales clerks and servants, 20%; and unskilled laborers, 25%. Of interest was the observation that 4% of the subjects were employed as taxi, bus, and truck drivers.

In a survey by Lennox and Markham,[2] of 140 epileptics, 89 had experienced seizures at work and 50 were discharged. These discharged employees represented 55% of the group having seizures at work.

As the problem is studied, however, one is forcefully reminded that epilepsy is not a disease but a symptom.[3] As Hughlings Jackson said: "A convulsion is a symptom and it occurs with all sorts of conditions of ill health, at all ages and under innumerable circumstances." In other words, any seizure is a manifestation of an underlying physiological disturbance in brain function. Although there are more than 50 known causes of seizures or disorders of consciousness, the commonest are acute alcoholism, cranial trauma, cerebrovascular accident, poisoning, and diabetic acidosis.[4]

Twenty-four cases of convulsive disorders studied at the Esso refinery at Bayonne, N. J., from 1954 to 1956 were reported in 1956. In the preliminary study, it was evident that a larger industrial population should be studied and the experience analyzed with reference to employment, job placement, accident experience, and absenteeism of the epileptic group.

An additional 34 cases of convulsive disorders were studied at Esso's Baton Rouge Refinery from 1957 to 1959. This report is a review of the 58 cases at the two refineries. All the patients had a definite history of a convulsive seizure or loss of consciousness. Clinical evaluation in each case was based on complete history, physical and neurological examination, urinalysis, blood sugar determination, electrocardiogram, electroencephalogram, x-rays of the skull, and, when indicated, spinal puncture and pneumoencephalogram.

Presentation of Data

Prevalence—Fifty-eight patients came from a combined population of 9,600 employees at two oil refineries, giving a prevalence of 6:1,000. The over-all refinery population was a relatively constant industrial group, 95% of whom were males averaging about 45 years in age with 18 years' service. For comparison, the convulsive disorder group was 100% male with average age of about 45 years with more than 25 years' service.

Age at Onset—The distribution of cases by

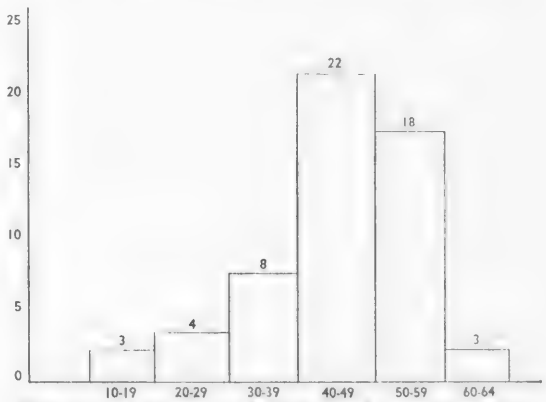

Fig. 1—Age at onset of 58 cases of convulsive disorder in industrial workers.

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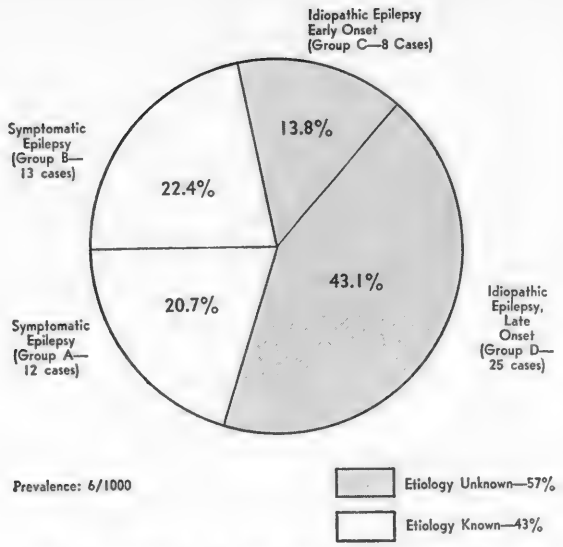

Fig. 2—Etiology of 58 cases of disorders of consciousness in industrial workers.

age at onset is shown in Fig. 1. In 75% of the cases onset occurred after age 40; in 5%, before age 20 or after age 60. (Company retirement age is 65.)

Etiology—A definite etiological factor was identified in 25 cases (43%). There were 12 cases of symptomatic epilepsy (Group A in Fig. 2) secondary to organic brain damage: 3 brain tumors, four from scar tissue due to trauma, three from vascular accidents, and two from inflammatory disease.

The remaining 13 cases in which there were symptomatic seizures are shown in Group B, Fig. 2. These cases, except for three unclassified ones, include the general conditions and diseases which may cause a convulsive seizure: two, endocrine diseases; two, alcoholism; one, drug addiction; two, carotid sinus syndrome; and three, cardiovascular diseases.

No definite etiologic factor could be identified in 33 cases (57%). Group C, Fig. 2, consists of 8 cases of idiopathic epilepsy (by definition, an onset early in life and an unknown etiology).

Group D includes the remaining 25 cases of unknown etiology whose onset was relatively late in life; hence, the common descriptive title, "epilepsia tarda." The onset of all such cases in this series occurred after age 45.

Frequency of Attacks—Forty-eight patients, or 83%, had experienced more than one attack (Table I). The majority (52%) had experienced from two to five seizures. All the patients in Group C. Fig. 2, (early idiopathic) had experienced more than one seizure. The experience of multiple seizures in the other three groups ranged from 77% to 83%.

Sickness Absenteeism—Sickness absenteeism experience is shown in Table II. The criteria for excessive absenteeism were more than 15 days' total sickness per year or more than four absences per year. By this definition, sickness absenteeism was average or better in 81% of the cases. In 6 of the 11 cases with high sickness absence records, excessive use of alcohol was suspected as being an important factor. There was no apparent relationship between the occurrence of epileptic seizures and sickness absenteeism.

Accident Experience—A review of the accident experience for the group is limited to disabling injuries—both industrial and off-the-job accidents. There were 49 employees with no disabling injuries, while 8 suffered one or more off-the-job disabling accidents and 1 had an industrial losing-time accident. The total number of man-years worked was 1,494 years.

The industrial losing-time accident resulted in a loss of seven workdays. This was not related to a convulsive seizure. Table III shows a frequency rate of 0.3 (number of disabling injuries per million man-hours worked) and a severity rate of 2.3 (number of days lost per million man-hours worked) for the industrial injury experience. The frequency and severity rates for the nonindustrial accident experience were 3.2 and 94, respectively. "Active" off-the-job time of 312 hours per month recommended by the National Safety Council was used in this calculation. The average frequency rate for all disabling industrial injuries at both refineries during this period of study was 2.5 and the severity rate was 1,176. Comparative data for nonindustrial disabling injuries are

Table I—Frequency of Attacks

No. of Attacks Known	No. of Cases	%
1	10	17
2-5	30	52
6-10	11	19
More than 10	7	12

Table II—Sickness Absenteeism

Experience	No. of Cases	%
Less than average	33	57
Average	14	24
Excessive	11	19

Table III—Accident Experience

Type of Disability	Frequency Rate	Severity Rate
Industrial	0.3	2.3
Nonindustrial	3.2	94.0

Table IV—Work Restrictions

Type	No. of Cases	%
Permanent	38	66
Temporary	6	10
Unrestricted	14	24

not available. There were eight employees responsible for 18 disabling off-the-job injuries. Seizures while off-the-job were causally related in eight of those disabling injuries, and the excessive use of alcohol was an important factor in a number of seizures and consequent accidents.

Work Restrictions—Permanent work restrictions were in effect on 38 patients, or 66% (Table IV). In this group of employees were 13 skilled workers assigned as boilermakers, carpenters, pipefitters, insulators, machinists, instrument repair men, and process operators. In addition to these skilled workers, there were 11 semiskilled and 14 unskilled. There were six patients for whom work restrictions were removed after a seizure-free period of one year or more of observation. They are shown as temporary restrictions. All were in skilled job classification. In the unrestricted group, there were 14 employees (4 skilled, 4 clerical, 2 supervisory, and 4 unskilled).

Treatment Experience—Thirty-one patients received anticonvulsant therapy prescribed by their attending physicians. In addition, nine other patients had treatment of their underlying disease, e.g., diabetes, alcoholism, and hypertension. The remaining 18, or 30%, did not receive anticonvulsive or other therapy during the period of observation.

Follow-up Experience—At present, 22 employees are still working, 19 are retired, 11 have been terminated, and 6 are deceased. The retired employees were divided into 15 retirements for nonmedical reasons and 4 disability-type retirements. In three patients, the disability was the result of chronic vascular disease, and loss of consciousness was not a factor in the consideration for retirement. Of the 11 patients terminated, 6 were in a group laid off because of a general reduction in work force (epilepsy not a factor), 2 did not return to work after prolonged sickness absence (not related to epileptic condition), 2 resigned, and 1 was discharged for disciplinary reasons.

Comments

The prevalence of epilepsy in the general population is low —approximately 5 per 1,000— with males more commonly affected than females. Our refinery population experience of 6 per 1,000 parallels this closely.

Studies by Green and Steelman,[5] Lennox,[6] Bridges,[7] Lilienfeld and Pasamanick,[8] and others have shifted the emphasis from heredity to brain injury as the factor of greater etiologic importance in epilepsy. No family history of convulsive disorders was found in the eight patients with early idiopathic epilepsy reported here.

The age of the patient at the time of the onset of seizures has considerable diagnostic significance.[9] If the onset of the attacks was in childhood, the presumptive cause is brain trauma, whereas in an adult it is brain tumor, until proved otherwise. As a rule, the later in life the onset of seizures occurs the more probable is the presence of an organic lesion of the brain. The more common conditions responsible for convulsions beginning in an adult are the intracranial space-occupying lesions, cerebral trauma, and vascular lesions.

About 30% of all cases of epilepsy begin after age 20. Of the eight early idiopathic cases in this series, three occurred prior to age 20. Epilepsia tarda, however, generally occurs after age 45 and is presumably due to arteriosclerotic changes which cause impairment of cerebral circulation.[10] Arteriosclerotic occlusions do produce epileptic seizures, but, according to Penfield, this is rare.

In analyzing the diagnoses in this series of 58 cases based on age at the time of onset (Table V), we found all 8 of the early idiopathic epilepsy cases in the young adult group. In the middle age group, there were two cases due to encephalitis, two neoplasms and two with cerebral trauma. In 22 patients (78%), vascular disease appeared to be the underlying cause. In the older age group, cerebral arteriosclerosis was also the predominant cause (eight patients, or 73%), although the group also included one patient with a tumor and two with cerebral trauma.

Sheehan[11] reported on 1,000 cases of epilepsy in which the first attack was experienced at or after 20 years of age. His study also shows the low incidence of family history, and stresses the etiologic importance of brain injury.

Seizures are an infrequent symptom during

Table V—Diagnosis of Cases by Age of Onset

Young Adult (20-35)		Middle Age (35-55)		Senescence (55-65)	
Idiopathic	8	Vascular disease	22	Vascular disease	8
Trauma	0	Trauma	2	Trauma	2
Neoplasm	0	Neoplasm	2	Neoplasm	1
Other	4	Infection	2	Other	2
		Other	5		

the acute phase of a head injury, and only one such case occurred in this series. When seizures develop, after the acute phase, the usual interval is 6 to 18 months after injury. In this series, there occurred three cases which demonstrated this. Various authors report an incidence of seizures following head injury from 2.5% to 40%; however, when all types of head injuries are included, the lower figure is probably more accurate. Wechsler[10] states convulsions occur in 5% to 10% of the cases of head trauma and skull fractures.

Intracranial neoplasm is a frequent cause of seizures in patients past 35 years of age. About a third of the patients with all types of brain tumors are reported to have seizures. Penfield[9] reported an incidence of 45%, and Thorpe[12] reported 37%. In the present study, the symptomatic group included three (43%) cases of seizures due to cerebral neoplasm.

In industry, interest in disorders of consciousness begins at the time of the personnel employment interview and medical preplacement examination. Many times, of course, the applicant will withhold any mention of "fits" in his past or family history. Careful attention to a previous history of head trauma, head or tongue scars, etc., may uncover a few persons for whom selective placement is possible. This emphasis, that the objective of preplacement evaluation is not rejection of persons from employment but their placement in productive jobs will do more to uncover people with convulsive disorders than the most elaborate screening tests.

Of the four employees with concealed history of early idiopathic epilepsy in this series, three had attacks at work, which resulted in disclosure, and the fourth had an attack at home. These four employees had an average of four and one-half years' service when discovered. The remaining four persons with early idiopathic epilepsy had their first seizures after employment, two of these appearing while the employees were at work and two while in the home environment. These four employees had an average of seven years' company service when diagnosed.

The importance of maintaining in productive assignments all persons, including those with some handicap, needs no emphasis. Certainly, it applies to the person with a disorder of consciousness. Few restrictions on the type of employment are necessary.[7] The epileptic, effectively controlled by medication and seizure-free for one to three years, may be allowed to climb and to work at protected heights. Those patients not under control should be kept from occupations associated with automobile driving, unguarded machinery, open electric circuits, unprotected ladders and scaffolds. They should also be protected from hazardous situations where they may injure themselves or others,[13] such as exposure to moving objects, the handling of flames (welders), and exposure to toxic materials, such as lead, mercury, arsenic, CO, and H_2S. These work restrictions were effective in protecting the 38 restricted patients referred to in Table IV.

In Denmark, in 1937, an epileptic could obtain a driver's license if he had been free from attacks for five years,[14] without the use of drugs. A little later on, this free period was reduced to three years and still later to two years, with or without the use of drugs,[15] the risk of his having a seizure while driving being presumably less than the risk that any elderly driver will have a coronary thrombosis or cerebral hemorrhage.

In this country, the state of Wisconsin in 1949 first enacted legislation to allow epileptics to drive under certain provisions. The epileptic had to be free of attacks for two years and to renew the license every six months. A medical certificate had to verify freedom from seizures.[16] While it is a calculated risk, some physicians permit the epileptic to drive his own car after three years' freedom from seizures. Most authorities would agree that epileptics, diabetics requiring insulin, and those persons with certain heart conditions should not operate public conveyances because of the hazard of a sudden loss of consciousness.[17] None of the 38 patients restricted were permitted to drive or operate company vehicles.

Employment is a difficult problem for the epileptic.[18] The average employer believes the epileptic represents absenteeism, on-the-job injury, and loss to company property. According to Bridges[7] and Cohen,[19] however, 75% to 80% of these persons between seizures are employable as normal persons, with desirable mental and physical qualifications for job performance.

The fear of an increased accident rate among epileptic employees does not appear justified. Actually, an unusual accident rate has not been demonstrated. It is stated that less than 7% of the industrial injuries of epileptics are due to seizures.[1, 2] A study of the performance of the physically handicapped employee in manufacturing industries, for the U. S. Department of Labor, recorded no significant difference between the epileptics and matched unimpaired workers.[20] A review of our records shows such employees have a good attitude toward work, and their sickness absenteeism and on-the-job accident experience is better than average (Tables II and III). Only one disabling indus-

trial injury occurred in the 58 patients. This accident was classified as submajor and it was not related to or the result of a seizure. Off-the-job disabling injuries were noted, with eight employees being involved in 18 disabling accidents. Since these injuries occurred off-the-job, it was difficult to evaluate the relationship to seizures in all accidents, although, of the 18 studied, 8 were known to be related to seizures.

It is important that patients subject to seizures be warned about the effects of alcohol. The use of alcohol was a factor in the poor sickness experience and increased off-the-job disabling injuries reported for a small segment of the group reported here. In a number of instances, the same few patients accounted for both the poor sickness and accident experience.

About 50% of all patients with seizures can be completely controlled with medications[5, 10] with another 30% sufficiently controlled so that the attacks no longer interfere with their regular activity. Thus, about 80% of patients with seizures should be satisfactorily controlled by effective medication. Of the 58 patients reported on here, 31 patients, or 54%, were controlled by anticonvulsant medication, another 16% had other forms of treatment, and the remaining 30% received no anticonvulsive treatment.

It is the responsibility of the industrial physician to recommend the restrictions required in the placement of persons with seizures. He must obtain the cooperation of the epileptic in the program of medical management. The medical progress made in the treatment of seizures has altered the handicap of these employees.

Summary

In an oil refinery population of 9,600 employees, 58 cases of convulsive seizures or loss of consciousness are reported with a prevalence rate of 6 per 1,000. Analysis of the group showed an unknown etiology (idiopathic epilepsy) in 57% and a known etiology (symptomatic epilepsy) in 43%.

The sickness and accident experience of these patients is better than that of the total employee population.

The problem in industry is twofold. First is the problem of the epileptic who conceals his medical condition in a preplacement examination and may be assigned without work restrictions. The second problem, as with the diabetic worker, is the working employee who develops epilepsy during the course of employment. Industry is paying more attention to the employment and rehabilitation of the handicapped. It expects, however, all employees, properly assigned, to be productive, and this expectation is also the desire of the handicapped employee. The physician plays his part by proper evaluation of the employee's health problem and recommendations for proper job placement.

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Present Status of Occupational Health in Korea, The Philippines, and Taiwan

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IN THE 15 years which have elapsed since the end of World War II, we have witnessed an emergence of new nations whose people had been existing in an economy based largely on agriculture. Today, these countries are going in for a planned economy to include with agriculture such activities as manufacturing, mining, commerce—in fact, an attempt at a balanced exploitation of all their natural resources. These governments recognize that opportunities must be offered to their people for acquiring technical skills so that they can grow in productive efficiency, become capable industrial workers and thus help their country to achieve economic independence. At the same time, these nations are attempting to educate their people in an effort to instill in them a desire to seek more and better goods with which to improve their mode of living.

It is only in recent years that these countries have come to realize that the only effective manner to exploit their natural resources is to make sure of the well-being, productivity and financial solvency of their people. It is for these reasons that they are making great efforts to improve their public health and more directly the health of their labor force upon whom economic development depends so much. Recently, I had the opportunity to observe this awakening interest in occupational health in three Far Eastern nations. The U. S. Operations Mission to the Republic of Korea, which has been providing economic and technical assistance to that country in an effort to strengthen its economy, realizing the important role played by occupational health in economic development, invited me to conduct a survey of the health problems in the industries of Korea and to advise on the type of preventive program which would best fit the needs of that nation. I was therefore able to spend two months in the Republic of Korea studying at first hand the occupational health problems in its factories and mines. At the completion of my survey in Korea, I was invited to spend a brief period in the Philippines and in Taiwan, both of which countries are presently industrializing at a very rapid pace. The material which follows is based on my observations of occupational health as it is practiced today in these three countries.

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Background Data

The table which follows presents some background material with reference to the principal features of the population, the labor force and its distribution in each of the three countries. It is obvious that in each country the labor force constitutes about a third of the total population. This is true pretty much over the entire world but, unlike in the United States and Western Europe, the three countries under consideration have a young population with 45% to 50% of their people less than 15 years of age. The life expectancy of the people in these countries varies from 50 to almost 60 years of age, and so the bulk of the people who are working for a living are very young in comparison to those of some of the older industrial nations.

Another common characteristic of these three countries, as may be seen from the tabular data, is that the majority of the gainfully employed are engaged in agriculture and allied pursuits. For example, in Korea 78% of the working population is engaged in farming; in the Philippines this percentage is 59 and in Taiwan 64. Since agriculture in these countries is still largely a manual labor activity, and in some instances consists of subsistence farming, it is not strange to find that

Population and Employment Data in Korea, the Philippines, and Taiwan

	Korea	Philippines	Taiwan
Population, 1958			
Total	23,860,000	27,000,000	10,431,341
Gainfully employed	7,826,990	9,000,000	3,774,384
Agricultural	6,131,427	5,300,000	2,394,000
Nonagricultural	1,695,563	3,700,000	1,380,384
Manufacturing	260,427	1,125,000	325,000
Mining	37,293	30,000	75,000
Number manufacturing plants	12,971	15,000	45,000*
Percent of workers in plants employing less than 100 persons	66.7†	50.0	1.5‡
Contribution to gross national product			
Agriculture	39.5%	36.0%	31.7%
Nonagriculture	60.5%	64.0%	68.3%

*31,000 factories employ between 1 and 3 workers.
†Only 325 plants employ more than 100 persons each.
‡Only 300 plants employ more than 100 persons each.

although agriculture in these countries employs two-thirds of the labor force it contributes to only about one-third of the gross national product. The mining population in Korea and in the Philippines is about equal in size but that in Taiwan is practically double of each of the others, largely because of the many hand laborers employed in coal mining.

Another common factor among the three countries visited is the size of the industrial establishments, which by Western standards are indeed very small. In the United States we have always classed plants employing less than 500 workers in the category of small establishments. In contrast, in the three countries under consideration a plant employing 400 or 500 persons would be considered as a large enterprise. For example, in Taiwan there are about 14,000 factories employing 3 or more persons but only 300 of these factories employ more than 100 persons and only 28.5% of all the workers are employed in factories of this size. The same situation exists in Korea, where out of nearly 13,000 plants only 325 employ more than 100 persons each and only one-third of the workers were employed in plants of such size. This state of affairs somewhat complicates the occupational health picture, since it is a well-established fact that accident rates in very small plants are from two to three times as high as in large plants and, in addition, the small factory owner is not likely to have the economic means to invest in a preventive program.

In all of the three countries visited there is still a lack of what is known as heavy industry, largely because of a scarcity of the essential raw materials for such industry and the required heavy outlay of capital for these enterprises. Most of the factories in all of the three countries are largely engaged in the production of light consumer goods such as textiles, ceramics, food products, leather goods, and similar articles. However, there is a serious effort being made in all of these countries to build and operate iron and steel mills, chemical plants, and cement mills. Already such plants are in operation in each of the three countries and because of a lack of a preventive program are producing their quota of numerous accidents and excessive occupational diseases commonly associated with such industries.

Health Problems Among Workers

In all three countries the working conditions in the 64 plants visited were found to be about the same, with the possible exception of a few new plants in the Philippines where modern machinery and methods have been introduced. The majority of the industries are but very little mechanized, thus resulting in a great deal of manual labor and large work forces. For example, it was not uncommon to encounter a glass factory or a plywood mill employing 800 to 1,000 workers, which could easily be operated with say 200 skilled employees, provided the plant was equipped with modern machinery, well laid out and maintained.

Most of the plants were dirty, crowded and unsanitary. Such conditions were particularly true in Korea and in Taiwan. Also, in these two countries, there was practically nothing being done to provide good emergency medical care at the plant.

In Korea medical care is not provided to workers or to their families for general illnesses except in a few instances, such as in some of the government coal mines and in a few of the larger and more modern factories. The same situation obtains in Taiwan, where medical care is provided only to workers and then only in case of an accident or an occupational disease acquired on the job.

In the Philippines emergency medical care was quite common; this is largely due to the

law which requires free emergency medical and dental treatment for employees and laborers of commercial, industrial, and agricultural establishments. The type of service and personnel vary with the number of people employed. For example, plants employing more than 300 workers must provide not only a well-equipped dispensary but the full-time service of a physician and a dentist as well as an infirmary with the capacity of one bed for each 100 employees. As a rule, however, it is only the large factories that maintain their own dispensaries and full-time staffs as required by law, because the law also specifies that if there is a dental clinic and a hospital within 2 kilometers (1¼ miles) the provisions of the law with regard to medical care may not be required. In such cases the industrial establishment may enter into an agreement with the nearby hospital for the required services to workers. The Philippine employer is not required to furnish medical care to the family of a worker.

Many of the plants in Korea and Taiwan were found to contain a great variety of accident hazards, the commonest of which were unguarded moving machinery, slippery floors, steep stairways with no hand rails, crowded working conditions, and fire and explosion hazards. A great variety of exposures to toxic materials were also encountered in the plants visited. Silicosis is a serious problem not only in the mines but in many of the industries using siliceous materials, as in ceramic and glass factories. Exposure to toxic gases and vapors of organic solvents were quite common, as was exposure to poisonous metallic compounds such as lead, mercury, and manganese. Hazards from excessive noise and heat were also encountered in quite a few of the plants.

The sanitary facilities in the plants were on the whole quite bad. Only a few of the modern factories provided good or fair facilities such as drinking water, lavatories, showers or baths, change rooms, and dining rooms for their employees. For the most part, in many of the plants these facilities were inadequate and badly maintained. As a rule, sanitary facilities were about the same as the actual working conditions. In other words, a poorly operated and maintained factory usually provided similarly bad sanitary facilities. There seems to be a lack of understanding on the part of management in the plants of these countries that there are substantial monetary losses resulting from neglect of sanitary facilities and from improper maintenance of their plants.

This lack of a preventive program in industry is further complicated in these countries by the low level of development in their public health programs. Communicable diseases are still very high in these nations and account for a great deal of lost time from illness among their workers. For example, tuberculosis is the second highest cause of death in the Philippines even today. This disease is also of major importance in Korea. Intestinal parasites infest close to 90% of the population of Korea, and diarrheal diseases are extremely high in that country during the summer months. In all of these countries much needs to be accomplished in the field of public health. There is a great need for strong administrative organizations in public health and sufficient funds and trained personnel to carry out a worth-while program.

My observations of the working and living conditions of the people in these three countries lead me to conclude that this apparent neglect of the well-being and health of the labor force is largely a result of ignorance. Employers on the whole do not seem to realize that the so-called "cheap" labor, particularly where the labor supply is abundant, is in the final analysis the most expensive type of labor of its kind. Expensive, because this kind of labor is very inefficient, producing pitifully low quantities per capita in comparison with a healthy labor force. This type of labor experiences extremely high accident and disease rates. For example, in Taiwan, utilizing data released by the Taiwan Labor Insurance Agency, which is comparable to a Social Security Agency in other countries, it was possible to show that the average worker loses about 11.4 days a year from disability of one kind or another. This figure when applied to the labor force of the country produces a loss of about 43,000,000 days a year. In terms of the economic value of such a loss to production we find that this represents about 18% of the national income of that country and is almost equal to its entire yearly budget. This figure compares very closely with my findings in 13 countries in Latin America, where my studies revealed losses due to disability in industry amounting to 15% of the national incomes of those countries.

Current Practices in Occupational Health

Of the three countries under consideration the Philippines is the only one which has had a fairly long experience in occupational health. When still under the tutelage of the United States, before the beginning of World War II, the Philippine government had established an occupational health service and its director, a physician, had received graduate training in the United States.

At present, occupational health and safety

activities in the Philippines are being carried out in two departments—the Department of Health and the Department of Labor. There is a Division of Industrial Hygiene in the Bureau of Health Services which is one of several bureaus in the Department of Health. The Division of Industrial Hygiene presently consists of a medical officer, who serves as chief, and three medical specialists, who are also located in the central office. The only engineering position in the Division is presently vacant. There are three medical officers, one dentist and one nurse who work in industrial hygiene out of one of the regional offices of the Bureau of Health Services. There is also a staff in industrial hygiene assigned to the Division of Environmental Sanitation (one of the four divisions of the Bureau of Health Services), consisting of one medical officer, four public health nurses, and three sanitary inspectors. This latter group still functions under the auspices of the Division of Industrial Hygiene. There are also three persons in the laboratory, a chemist and two technicians, who, although they do work for the Division of Industrial Hygiene, are administratively under the Bureau of Research and Laboratories.

It is obvious that the type of organization which is at present operating in the Philippines in industrial hygiene is not conducive for a really effective attack on the many occupational health problems which exist in the industries of these islands. For one thing, there is an imbalance in the professional staff with very little work being possible in the evaluation and control of environmental health hazards, since there is no engineering staff. The several plants which I visited in the metropolitan area of Manila all showed the need for environmental control of hazardous exposures. The Division of Industrial Hygiene has done a good job in promoting an interest in the subject among the industries, the universities, and the medical profession. Now it needs to reorganize itself and acquire sufficient engineering and chemical personnel to meet the many demands being made by industry for this type of service.

The Department of Labor is not organized in a manner to provide industrial hygiene services to industry. Its Health and Safety Division has no trained personnel in industrial hygiene nor the essential laboratory and field equipment with which to carry out this type of work.

In Taiwan, there are two agencies in the national government which have responsibilities in the field of industrial health. Both of these are located in the Ministry of Interior. The Department of Labor functions through eight sections dealing with inspection, welfare, insurance, labor standards, etc. The Department of Health of the Ministry of Interior operates through four sections: registration, food and drug, public health, and international health. Both of these agencies are largely of an advisory and policy-making character, with the implementation being accomplished by the provincial government of Taiwan, which is at present the only province under Nationalist China rule.

In the provincial government, there are three agencies with a responsibility or interest in industrial hygiene. The provincial Department of Public Health which has its headquarters in Taichung, is officially known as the Public Health Administration and consists of 12 divisions and 8 affiliated institutes, one of which is Environmental Sanitation. Also, there are health programs in some 22 counties and cities and about 360 villages. In the counties and cities the health work is accomplished through four divisions: rural health, communicable diseases, medical care, general administration. In the villages, there are health stations, each with a minimum of one doctor, one nurse, one sanitarian, and a clerk. Industrial hygiene activities are placed in the Institute of Environmental Sanitation, located in Taipei, and are centered in the Division of Industrial and Occupational Hygiene.

This Division is a recent organization, having been created only 18 months ago. At the present time, its staff consists of a chemical engineer with some training in public health received in the United States three years ago. He is assisted by one chemical engineer assigned to work in radiology; another chemical engineer and a chemist for industrial hygiene work; and a chemical engineer and a chemist for air pollution studies. There is also a statistician. In other words, the entire staff consists of four engineers, two chemists and a statistician.

The International Co-operation Administration which maintains a Mutual Security Mission in Taiwan has had an industrial hygiene engineering consultant working with the Industrial Hygiene Division since July 1959. Under this arrangement the activities in this field should be greatly strengthened during the next few years. It is hoped that medical personnel will be employed to work in cooperation with the nonmedical staff of the Division. This Division is still going through its shakedown period, training its staff, acquiring equipment, and defining its problem through surveys in industry. However, it has already made itself felt in occupational health and has been able to effect many improvements in working conditions even with its limited staff and facilities.

The Labor Insurance Bureau may be likened to the Social Security Bureau in the United States. This Bureau provides benefits for death and survival, maternity, old age, injury, and sickness. At the present time, the fund is made up of a tax of 3% of the workers' monthly wage, with another 1% added for sickness. The insured worker contributes 25% of this tax and the employer 75%. The government adds a small subsidy for every insured worker. At the present time the Labor Insurance Bureau has no one engaged in industrial hygiene activities nor is it planning to enter this field.

The Provincial Industrial and Mining Inspectional Committee of the Provincial Department of Public Welfare administers the labor laws of the island. These laws or regulations pertain to such matters as medical care in industry, working conditions, wages and hours, and so on. This Committee is administered by a director, two deputy directors, two secretaries, and six division chiefs. The Divisions are Safety, with 11 inspectors; Mining, with 8 inspectors; Health, with 4 inspectors; Labor Conditions; Statistics; and Administration. This Committee has no trained people to speak of and is not equipped to conduct a modern industrial health program. Fortunately, the engineer in charge of industrial hygiene in the Institute of Environmental Sanitation, is also a member of the Industrial and Mining Inspectional Committee, so that the Division which he heads is in a position to do all of the technical work for the Committee.

In Korea, there is only the Ministry of Health and Social Affairs which is legally empowered to act in matters of occupational health. Obviously, under the present arrangement there should be no jurisdictional problems as to which agency should administer occupational health activities. The two bureaus in this Ministry which are legally authorized to carry out occupational health and safety work are the Bureau of Preventive Medicine and the Bureau of Labor. At the present time neither of these two bureaus is doing anything in the field, but a great deal of interest was encountered in starting a cooperative program between the two bureaus of the Ministry of Health and Social Affairs.

In the Ministry of Commerce and Industry are a Bureau of Mines and a Bureau of Industry. The Bureau of Mines is definitely interested in health and safety problems in the mines of the Republic of Korea but for the present has only one safety engineer to carry out this kind of work. This Bureau has prepared a health and safety code which is now waiting enactment by the National Assembly. This Code provides for the establishment of a safety section in the Bureau of Mines. The Bureau of Industry has shown no interest in this area for the present.

In many nations voluntary agencies have very often played an important role in the development of various programs, including those of public health, and have been most beneficial in aiding occupational health activities. Some of these are professional societies in the fields of medicine, engineering, nursing, while others are organizations sponsored by management or labor. Universities have also played major roles in this field through the provision of trained personnel and in research.

In each of the three countries visited contacts were made with various nonofficial organizations such as medical schools, schools of hygiene and public health, engineering schools, chambers of commerce, mining associations, and other trade associations. All of these are presently inactive in occupational health and safety but show a definite interest in cooperating in any program which will be developed. In the Philippines, largely because of the efforts of the Director of the Division of Industrial Hygiene, there is a very active Association of Occupational Medicine. There are several hundred members in this Association, many of whom work either part-time or full-time in industry in accordance with the requirements of Law No. 1054, previously mentioned.

Benefits of Improved Health Practice

It is only recently that in the more highly industrialized nations management has begun to consider seriously and to do something about the economic losses which are involved in the time lost from productive capacity by its labor force from a wide variety of disabilities, some of which are avoidable. In spite of the fact that at present labor is abundant and that wages are low in the three countries which I visited, the neglect of working conditions and the health of the workers are already beginning to manifest themselves in considerable economic losses even in these nations. Furthermore, these nations are beginning to add to their production costs by the enactment of social legislation such as health insurance, old age pensions, survivor benefits, and workmen's compensation against accidents and occupational diseases. Such legislation is desirable in the long run but can prove to be a heavy economic burden to a struggling nation if there are no concurrent programs of prevention to reduce the disability for which compensation is provided by law. Nor can compensation ever give back a man his health or his lost dignity

when he is not any longer a productive worker.

There is ample evidence available to show the benefits to a nation when it gives consideration to the well-being of its people. To begin with, there are the benefits accruing from decreased illness, injuries, labor turnover, and spoilage of materials. Then there are the benefits arising from decreased costs to the worker and employer in the reduction of wage losses, cost of illness, compensation costs. Also, we must not overlook the benefits from improved health, safety, and efficiency. Finally there are the very important intangible benefits due to improved morale and better labor relations.

Even today there are some industrialists in these Far Eastern countries I visited who consider the provision of safe and healthful working conditions and community health and sanitation facilities as good business. These enterprises clearly and dramatically demonstrate that good health and welfare conditions benefit not only the workers but also the employers. For example, one textile factory which was visited, employing slightly more than 1,000 persons, paid more than average salaries, provided excellent living facilities, and exceptionally good working conditions. This factory has practically no labor turnover, and there is always a long list of persons who wish to work at this plant because of its reputation for fair treatment and good working and living conditions. As a result of these provisions on the part of this company, its daily absenteeism is approximately 2.4%, whereas it is well known that in factories in this part of Asia the normal absenteeism rate is about 15%. It is calculated that this company saves about the equivalent of U. S. $150,000 a year just through a reduction in its absenteeism alone, to say nothing of the benefits derived from a stable and contented labor force and more efficient production. Another example was found in the case of a coal mine employing approximately 800 persons. At this particular mine working conditions both underground and on the surface were found to be good and living conditions were unusually good. In addition to a better than average wage, each family of a worker received 50 kg of rice a month and a certain amount of cotton cloth free. At this particular mine the tonnage per man is considerably in excess of that in other mines in the area.

Disability is proving to be a serious economic factor is production costs in industrial nations and it is rapidly becoming an economic factor in the lesser industrial countries which are enacting social legislation. Such legislation represents only half the job, the other half being prevention. And it is exactly in this area of action where responsible government must take a leading role. Fortunately, there are today international agencies which can assist governments in the development of modern occupational health programs.

In closing, I should like to emphasize strongly that occupational health is so intimately tied in with economic progress that any plan for the economic development of any given country or region must take into consideration the development of an occupational health program within that plan. In this manner we may hope to obtain real progress in overcoming some of the inequalities now existing in this world and add our share for the betterment of mankind.

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For further information, write: H. W. Wellmerling, M.D., The American Fracture Association, 610 Griesheim Building, Bloomington, Ill.

Topical Review

Modern Trends in the Treatment of Lead Poisoning

A Review of the Literature on the Use of Edathamil Calcium-Disodium

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ALTHOUGH lead absorption, which when present in excess produces clinical lead poisoning, has been known from the time of Hippocrates, there has been no specific treatment available until the last decade. As one reviews the 10 years of development of the use of edathamil (ethylenediaminetetraacetic acid) as a specific therapeutic agent for the treatment of lead absorption in adults, one is struck by the fact that changing trends in such treatment involve largely details, such as dosage, frequency, and duration, whereas the basic principles underlying the use of chelating agents for treating lead absorption have not varied the world over.

In fact, the principle of chelation itself is not new, for citrate chelation dates back to 1941.[1] Its most effective application to the problem of the elimination of lead from the human organism with the use of edathamil calcium disodium (monocalcium disodium ethylenediaminetetraacetate; also called calcium EDTA and Versene) is, however, relatively new. The last 10 years have seen the use of this drug for the treatment of lead absorption become worldwide.

Basis of Action

The basis of action of this new drug is that it chelates or binds a metal ion, like lead, by complexing the metal in a ring structure so tightly that the complex is nonionizable. The resultant end-product is a metal chelate which is a stable, water-soluble, readily excreted, nontoxic compound. The successful employment of chelating agents for the control of undesirable cations in solution and thus making chemically clean large containers in industry, suggested the use of the same chelating agent, edathamil, as a means of mobilization of certain toxic metallic ions in man. While at first the sodium salt of edathamil was used, the calcium salt is now used to avoid the marked serum-calcium lowering when the unbound edathamil sodium is used. This thus avoids the development of tetany which arises when the serum calcium is dropped rapidly by the edathamil sodium, as found by Popovici and colleagues[2] as early as 1950 and by Spencer[3] in 1952.

The "solubilizing" property of edathamil suggested its use for mobilizing heavy metal in bone. The edathamil forms a much stronger bond with lead than does the citrate which was previously used for chelation. The lead displaces calcium from the combination of edathamil calcium because of the greater stability constant of edathamil lead, as studied by Foreman about 1950 and reported[4] at the conference on lead poisoning at the Massachusetts General Hospital in Boston, Mass., on Feb. 8, 1952. Following animal studies with carbon-labeled edathamil, Foreman showed that 60% to 80% of the drug is excreted within 6 hours and 95% to 99% within 25 hours when given intravenously.

First Clinical Case

The first human patient actually to be treated with Calcium Disodium Versenate was studied and treated by Bessman, Reid, and Rubin, after his entrance to the hospital (Children's Hospital, Washington, D.C.) on June 1, 1951. Their report on this case[5] was published in March, 1952. The dosage on the 20th hospital day was 0.750 mg per day in three divided doses, without apparent toxicity and no recurrence

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of the transient "oliguria" originally noted. After 12 days' treatment, use of the drug was discontinued, a total of 6.5 gm. of Calcium Disodium Versenate having been given. The authors felt that the patient began to improve greatly on the administration of Versene. The poisoning had occurred from the ingestion of paint from woodwork.

Aside from this first report of the use of Calcium Disodium Versenate in treatment of lead encephalopathy in a human infant, this review will do no more than mention in an additional bibliography the many valuable reports on the use of this drug in pediatrics.

In June, 1952, Belknap[6] reported on three cases of adults treated with edathamil calcium disodium for severe lead absorption and intoxication. Dr. Rubin,[7] who did the quantitative urine lead studies in these cases, conclusively correlated the positive excretion of lead with the elimination of the signs of clinical plumbism.

Originally Recommended Therapeutic Regimen

In February, 1953, Foreman, Hardy, Shipman, and Belknap[8] suggested a course of therapy for the use of edathamil calcium in cases of lead intoxication, besides listing four cases of children treated with the drug and the three cases of adults originally reported by Belknap. They listed no other cases of lead intoxication. Their suggested dosage was as follows:

1. Route by intravenous drip only: dose of not more than 0.5 gm per 30 pounds (13.6 kg) of body weight per hour.
2. Total dose limited to 1 gm per 30 pounds of body weight for 24 hours.
3. Maximum total dose per seven days of 5 gm per 30 pounds of body weight in divided doses.
4. Individual courses of treatment limited to 10 days with a one week rest period between; maximum dose of 7.5 gm per 30 pounds of body weight over 10 days.

In August, 1953, Foreman, Vier and Magee[9] published their work on the metabolism of C^{14}-labeled ethylenediaminetetraacetic acid in the rat. After parenteral administration, 95% to 98% of the compound was excreted in the urine within six hours. A maximum of only 18% was absorbed within 24 hours after oral administration.

In April, 1954, Foreman and Trujillo[10] reported on the metabolism of C^{14}-labeled ethylenediaminetetraacetate in human beings, all of whom were healthy young men. They found that 95% of the injected material given intravenously passed through the body unaltered and was excreted almost entirely through the kidneys by both glomerular and tubular excretion. They noted that the drug was poorly absorbed from the gastrointestinal tract (a maximum of 5%).

In April, 1954, Hardy and her associates,[11] from work done at the Occupational Medical Clinic at the Massachusetts General Hospital, Boston, reported on their experiences in three cases of chronic lead poisoning treated with edathamil calcium disodium. They felt that this substance increased the excretion of lead when it is present in the body, though in none of their three cases did they have a real chance to test its ability to relieve the symptoms of acute lead poisoning. Their experience, however, did demonstrate that this agent, administered by vein, is capable of causing a coincidental marked increase of lead excretion with simultaneous decrease in urinary coproporphyrin and a reversal of abnormal hematological findings. They noted also that the excretion of lead increased by lessening amounts over a period of sustained administration of the compound. They were investigating the possibility that intermittent treatment with this agent might be the method of choice to obtain high and harmless urinary lead levels. They felt they had in no way harmed their patients. They also noted a prompt increase in lead excretion after a single intravenous injection of edathamil calcium-disodium given to three normal control patients, with an increase of lead excretion in milligrams per day from 0.09 to 0.65, from 0.05 to 0.29, and from 0.04 to 0.45, an increase therefore from five- to ninefold.

All of Hardy's patients with chronic lead poisoning had anemia with a marked rise of stippled cells, and all three showed a definite lead line of the gums.

In the cases of lead absorption treated with edathamil calcium-disodium, the 24-hour lead excretion increased from 26 to 34 times the pretreatment average, while the controls not known to be exposed to lead, who had received one dose of edathamil calcium-disodium, showed an eight-fold increase in 24-hour urine lead excretion.

Belknap and Perry,[12] in December, 1954, reported on seven cases of industrial lead exposure and lead poisoning, all of adult lead colic type, three of which had also been reported in 1952. They indicated that lead excretion in the urine was increased 5 to 20 times, with a definite peak which was reached within the first 24 to 48 hours, together with a sharp dropping off of the urinary lead excretion after two or three days, in spite of continued treatment. All patients were given intravenously 5 cc, or 1 gm, of edathamil calcium-disodium in 250 cc.

of 5% dextrose in distilled water over a period of one hour twice a day for five days. This was followed by a rest period of two days, then a resumption of the five-day edathamil calcium-disodium course of treatment, then by another period of rest for two days, and, finally, by a third course of five days of edathamil calcium-disodium. In four cases where lead line and stippled cells were markedly present, they had practically disappeared by the end of the third course of treatment, that is, within three weeks after treatment was started. Abdominal symptoms, controlled by calcium gluconate, were not complicated by neurological involvement.

Simple Index of Adequate Deleading

Belknap, like Hardy, and Ruotolo and Elkins[13] noted that coproporphyrin usually dropped soon after the beginning of edathamil treatment. He felt that this finding might be of great significance as an index of real reduction of any possible damage to the internal organs, such as the liver, and that it might be used eventually as an index of the effectiveness of edathamil in deleading or ridding the system of stored lead.* Belknap also stated that a daily dose of 2 gm or lower may well be practical and safer than the 4 gm dose first thought advisable and that in the future we could initially treat for only two or three days and then rest for five days, a reversal of the original regimen of five days' treatment and two days' rest. Since then other investigators have confirmed in large part these suppositions.

Failure of Edathamil Alone to Relieve Lead Colic

Belknap also brought out the fact that intravenous treatment with edathamil does not give the prompt relief of lead colic which is always expected within one-half hour following intravenously administered calcium gluconate, which simply is a nonspecific relaxant of smooth muscle. He therefore suggested intravenously administered calcium gluconate at the onset of treatment, to be followed in two hours by a dose of edathamil, this alternation of the two drugs to continue for 12 to 24 hours as necessary for pain relief. This was calculated to give immediate pain relief, combined with a sharp reduction of circulating and therefore potentially dangerous lead.

The next major article to add more basic clinical information on the treatment of acute and chronic lead poisoning was published by Wade and Burnum[14] in February, 1955. It covered a report of five cases of adult human patients, three of whom were employees in a lead battery smelting plant. The drug was given intravenously in a daily dose of 0.5 to 2 gm in 500 cc. of isotonic saline over a period of one to two hours. The patients received an average total dose of 15 gm over a 10-day period of therapy. The urinary excretion of lead was increased more than 15-fold in all patients by the treatment with edathamil calcium-disodium. Serial lead determinations indicated a peak excretion occurring during the 12-hour period immediately following administration of a single dose of the drug, and a minor effect persisted through the second 24-hour period. All patients had stippled cells which disappeared with therapy, and all five patients had pretreatment gingival lead lines, all of which vanished during therapy except in one instance. No toxic signs or symptoms were observed during therapy. Finally, Wade and Burnum concluded that the edathamil calcium-disodium cannot completely delead the body, a condition they attributed to the fact that, as shown in rats, soft tissue lead is mobilized preferentially to bone lead.

Efficient and prompt relief obtained from edathamil calcium-disodium given intravenously for lead colic was reported by Perrault, Truhaut, and colleagues[15] in 1956.

Rest Periods

In May, 1955, Rieders, Dunnington, and Brieger[16] reported on 9 of 37 cases of chronic lead poisoning treated successfully with edathamil calcium-disodium. In contrast to previous workers, they advised treatment only once a week to allow a shift of lead concentration from bone to soft tissue, and commented on the efficacy of the agent in removing lead from soft tissue rather than from bone. They thus argued for repeated stimulation of fresh Calcium EDTA treatment at weekly intervals and found that with this form of treatment the excretion of lead was increased 100-fold. In addition, they, too, found a rapid decrease of urinary coproporphyrin with the edathamil treatment.

Further successful treatment with the intravenous use of edathamil calcium-disodium was detailed in a report of three cases studied by Markus and Spencer[17] of London, England, published in October, 1955.

Oral Use of Edathamil

A new possibility, that of using the edathamil calcium-disodium deleading agent in the

*In 1956 Chisholm and Harrison[18] concluded that the urinary coproporphyrin excretion provides a sensitive biochemical index of metabolically active and presumably toxic lead in tissues.

form of an oral tablet, was first suggested by Sidbury, Bynum, and Fetz[18] in their publication of January, 1953, after giving the drug to five adults and two children with excessive lead absorption. In comparing the intravenous and the oral administration, they found that with the intravenous route there was a 10- to 40-fold increase in the urinary lead excretion promptly on the first day of therapy, with subsequent values of a lower magnitude but never less than three times the observed pretreatment level; when the drug was given orally, the rise in excretion was more gradual with maximum excretion on the third or fourth day of therapy, with a 5- to 10-fold increase in 24 hour urinary lead above the observed control value. The treatment by either route was well tolerated and effective in producing a significant increase in excretion of lead together with a prompt alleviation of symptoms. Gastrointestinal absorption of lead-edathamil was suggested by the increase in urinary lead following oral therapy, and they admitted that the formation of the lead-edathamil complex in the gastrointestinal tract with subsequent absorption could not be ruled out.

In 1954, Cotter[19] stated that he felt that his four lead-poisoned patients treated orally had good symptomatic results borne out by satisfactory lead in urine values.

To disprove the efficacy of the oral treatment with edathamil calcium-disodium, Rieders and Brieger,[20] in February, 1955, stated before the American Academy of Occupational Medicine, that the orally administered edathamil calcium-disodium is apparently not absorbed as such. In the intestine a portion of the drug exchanges its calcium for such heavy metals as lead, iron, and copper. These chelates are then absorbed and excreted in the urine. The total effect is a transfer of metal from the intestinal to the urinary route of excretion without appreciable removal of metal from tissues.

A favorable report, however, was made in 1955 by Manville and Moser[21] on the apparently successful effect of oral edathamil calcium-disodium treatment given to 12 patients from a battery works. Tablets containing 250 mg of the drug were given, and then dosage was on the basis of 60 mg a day of edathamil calcium-disodium per kilogram of body weight. The tablets were given for the first five days of each week, and the daily intake was divided into four doses. Symptomatically there was relief of fatigue and constipation, and lessened fatigability. The authors reported that satisfactory lead levels in the blood and urine had not been achieved at the end of two weeks of the drug administration but their men who had excreted an average of 1.974 mg of lead before treatment, were excreting 3.6 mg after treatment, an increase of 82%. Stippled cells and porphyrin had practically disappeared at the end of three weeks. They recommended, however, the intermittent administration of edathamil by mouth.

Likewise, in May, 1956, Shiels and coworkers,[22] of Australia, reported the apparently favorable effect of the oral use of edathamil calcium-disodium in five industrial lead cases and the case of one small boy, using 2 gm twice a day for several days followed by a rest period of seven days and by a second course similar to the first. They noted marked increase in concentration of lead in the urine. If such a patient is still at work in a lead hazard and swallowing as well as inhaling lead compounds, the effect of the drug if given orally would probably be to convert this lead into readily soluble and absorbable lead. The result would be to increase the urinary excretion of lead but not to serve any useful purpose in doing so. However, in the case of a person who may be removed from the lead hazard for some time, they felt that the amount of lead which might be absorbed from the alimentary tract during the oral treatment is only a small fraction of the increased lead excretion. They found no serious untoward effect, and they felt that the oral method was capable of causing removal of lead from the bone.

Similarly, in April, 1956, Bell and coworkers,[23] of Denver, reported the same apparently beneficial effect of oral edathamil calcium-disodium on urinary and fecal lead excretion in three lead poisoning cases treated daily with 3 gm of the compound or intravenously. In these cases the combined urinary and fecal lead excretion response was approximately two-thirds as much on oral as on intravenous therapy, but it was felt that the oral administration caused a significant increase in both fecal and urinary lead excretion.

In January, 1958, Pagnotto, Elkins, and Bayka[24] reported on oral adminstration of edathamil calcium-disodium and concluded that the statement may not be entirely true that the increased excretion of lead following oral administration of edathamil is due solely to the absorption in the intestine of lead which would otherwise be excreted by the gastrointestinal tract.

Nephrotoxicity of Edathamil

In regard to possible contraindications to the use of edathamil calcium-disodium the question of damage to the kidneys from its use warrants special study. The first two cases of severe

damage of renal tubules noted on autopsy by Dudley[25] from the Massachusetts General Hospital records in March, 1955, were noted in two instances of treatment with the sodium, not the calcium, salt of edathamil given to one patient with far-advanced carcinoma and one with moniliasis in an attempt to lower elevated serum calcium levels with the sodium salt given in excessive amounts. Then in March, 1956, Foreman, Finnegan, and Lushbaugh[26] wrote a report on nephrosis from uncontrolled edathamil therapy. They treated a patient with excessive plutonium "burden" with 2.5 gm of edathamil calcium-disodium twice a day for four days, and then, after a two-day rest period, they continued to administer the drug for 12 consecutive days. Then the patient showed a 2+ reaction for albumin, mental dullness, nocturia, and frequency. Signs and symptoms of renal disturbance disappeared rapidly after the cessation of treatment, and by the fifth day the patient was entirely recovered. Because of this experience, experimental studies were also done on animals with large doses at supralethal levels of 3,000 and 1,000 mg a day per kilogram of body weight. While animals receiving dosages of 125 to 500 mg per kilogram per day developed kidney lesions at some time between 4 and 16 days of treatment, none of the animals receiving a daily dose of 62.5 mg per kilogram given for 16 days developed lesions, and some rats given 40 injections of 100 mg. per kilogram per day showed no evidence of renal damage. Extrapolating these data to the levels of therapy for men, it would seem that renal lesions would not appear in a man given 4.5 gm. of edathamil calcium-disodium daily, before at least 16 days, and that the recommended therapeutic level of 5 gm per day given not more than five days in succession and followed by a two-day rest period would be well within the desirable safety limits.

In summary Foreman and his colleagues stated:

> The demonstration of the hazard of renal damage occurring with the therapeutic use of EDTA should not be considered as a cause for stopping clinical use of the drug. Edathamil has proved too useful clinically to envision any curtailment in its use. Reversability of the lesions and the prolonged administration of large doses of the drug required to produce lesions experimentally in animals offer obvious means of using edathamil safely. Its use should always be attended by daily urine analysis and should be stopped at once with the onset of signs of renal tubular alteration. It would seem logical to proceed with extreme caution in the presence of a nephritis, and toxic nephrosis such as mercurial poisoning would certainly seem to exclude the use of edathamil because of the danger of synergistic enhancement of the nephrosis with ordinary safe dosage levels of the drug.

They suggested that the drug be used in doses of approximately 50 mg per kilogram per day, given for five days and followed by two days of rest before completing the regimen.

Fatal nephropathy during edathamil therapy in lead poisoning was discussed in detail by Heinrich Brugsch[27] of Boston, in 1959. He reported on the two cases reported by Dudley and colleagues, one an adult with tubular nephropathy with hypercalcemia due to osteolytic malignancy, the other a child with moniliasis who had received intravenous injections of edathamil sodium as a means of binding excessive amounts of calcium. He admitted that edathamil sodium is different from edathamil calcium, usually used for lead cases.

Brugsch also reported on the transient nephropathy of Foreman's patient, discussed above, who had absorbed excessive plutonium, and finally on two reports from Switzerland in 1957, dealing with the occurrence of progressive renal disease in patients treated with edathamil for lead poisoning. The first of these reports was by Vogt and Cottier[28] and concerned a patient who was erroneously given excessively high doses of "Versenat" of 40 gm a day. Then Brugsch referred to three cases reported by Moeschlin,[29] of Switzerland, who warned against the use of edathamil calcium because of toxic nephropathy with death in two cases following doses of 4 to 5 gm a day. Moeschlin suggested, however, the possibility that a smaller dosage, of 200 mg twice a day, might be without danger.

Depression of Bone Marrow by Edathamil

Another possible complication is that of damage to the bone marrow. Belknap noted a transient depression of the white cells in one case, in 1952, while David,[30] in 1959, recorded the apparent depression of bone marrow in three cases after rather high doses of edathamil calcium. Other investigators, including Saita,[31] with six patients treated with only 2 gm a day in two seven-day courses, have, however, noted no real depression of the bone marrow, while Claudon and Belknap,[32] in 25 subsequent cases, likewise saw no harm to bone marrow.

Diagnostic Use of Edathamil

In 1955, when, for the first time, edathamil was employed by Rieders and Brieger for diagnostic use, they stated that increases of urinary lead excretion by one parenteral administration of edathamil calcium-disodium were much greater in lead poisoning than in normal or

other pathological conditions, so that if more than 1 mg per liter was found in a 24-hour specimen of urine, obtained after intravenous administration of 70 to 100 mg of edathamil calcium-disodium per kilogram of body weight, then abnormally large amounts of lead were present in the soft tissue of the patient.

Again in January, 1958, the diagnostic and therapeutic use of edathamil calcium-disodium in excessive inorganic lead absorption was discussed in great detail by Leckie and Tompsett,[33] of the University of Edinburgh, in their study of eight cases from a wire mill. Their interest in the subject was originally stimulated when a patient suffering from lead poisoning was treated with a relatively small dose of edathamil, 0.5 gm twice a day, with excellent results, and the values for lead excretion compared favorably with those found in others who received a daily dose of 4 gm. They therefore decided to attempt to determine the optimum dose of the drug to be employed in the treatment of lead poisoning and the best mode of administering it. They considered it justifiable to treat with edathamil calcium-disodium any patient in whom excessive lead absorption was suspected. They surmised that if a diagnostic level of lead excretion could be achieved by the intravenous use of edathamil in order to assess excessive lead absorption and an upper limit of normal could be established, edathamil calcium-disodium would be a most useful diagnostic tool in industrial medicine. Lead excretion in subjects not exposed to lead varied between 0.019 and 0.190 mg in 24 hours, whereas after treatment with edathamil calcium-disodium it varied between 0.22 and 0.65 mg in 24 hours. On the other hand, the increase in lead excretion in the cases of excessive lead absorption, after treatment with Calcium EDTA, varied from 20 to 40 times. This is the contrasting information which appears to be of use in diagnosing excessive lead absorption where initial urinary lead values are not significantly high.

Decreased Dosage of Edathamil

In contrast with an early assumption that 2 to 4 gm of edathamil calcium-disodium was necessary as a daily dose for deleading, Leckie and Tompsett showed that a most satisfactory excretion of lead in the urine was obtained in the case of lead poisoning by giving intravenously only 0.5 gm of the compound but over a period of three hours twice daily. They found that increasing the dose above 2 gm did not significantly raise the figures of urinary lead excretion.

Leckie and Tompsett emphasized also the importance of lengthening the time taken for infusion in achieving a good excretion of lead. Giving the infusion over six hours secured almost double the urinary lead excretion obtained when it was given over one hour.

Significantly, in a total of nearly 100 intravenous infusions of edathamil calcium-disodium, Leckie and Tompsett observed no toxic effects.

Albahary, and Boudene[34] and Zambrano, Rossi, and Mantovano[35] agree on the diagnostic value of edathamil calcium-disodium, given intravenously in questionable cases. Albahary injects directly into the veins 0.5 to 1.2 gm of the drug in 10 to 20 cc of a 2.5% isotonic solution.

In another article in 1959, on the value of mobilization of lead by edathamil calcium in the diagnosis of lead poisoning in persons formerly exposed to lead, J. Teisinger and J. Srbova,[36] from the Clinic for Occupational Diseases of Prague, Czechoslovakia, stated that edathamil calcium caused an increase of 24-hour lead excretion of a considerable amount in their study of 47 individuals. In their controls, men not known to have been exposed to lead, after diagnostic immediate intravenous syringe injection (not perfusion, by gravity) the maximum value did not exceed 0.35 mg per 24 hours, rising from a maximum preliminary value of 0.100 mg before the injection. In their cases of actual lead poisoning, lead excretion in the severe cases amounted, after edathamil treatment, to values from 6.2 to 15.2 mg per 24 hours. They feel, therefore, that the degree of severity of lead poisoning seems to be proportional to the urinary lead level following the injection of edathamil calcium-disodium.

In their discussion, Teisinger and Srbova recapitulate various normal lead contents in urine as follows: In the United States a lead content of 0.01 to 0.08 mg per liter is considered normal, according to Kehoe.[37] The American Public Health Association,[38] in a report by its committee on lead poisoning, stipulated in 1943 that a lead excretion exceeding 0.150 mg of lead indicated exposure to lead, while in the Soviet Union values exceeding 0.06 mg per liter are considered as indicating slight poisoning, but that over all in Czechoslovakia an amount of 0.100 mg of lead in 24-hour urine is to be considered the highest normal value.

In the world literature these writers find that after administration of edathamil calcium the absolute amount of lead excreted in 24 hours by normal persons varies from 0.09 to 0.65 mg per 24 hours, as reported by Hardy and her co-workers in 1954, and that, Rieders

and Brieger in 1955 reported that after an intravenous infusion of edathamil calcium-disodium an amount of 1 mg of lead per liter of urine from a 24-hour sample indicates increased deposition of lead in the body. A somewhat similar result was obtained in 1957 by Desoille, Albahary, Truhaut, and Boudene,[39] who gave a value of 0.8 to 1 mg per liter as indicating a positive result after edathamil, though the amounts found in their three control cases so treated did not exceed a concentration of 0.530 mg per liter. Teisinger comments that Desoille had employed oral administration of edathamil calcium for diagnostic purposes, giving 4 gm in two portions, and found an upper limit in unexposed persons of 0.500 mg per liter. However, Teisinger believes that oral edathamil calcium is only slightly absorbed by the alimentary tract, having found an average of 2.6 mg to be absorbed, compared to Foreman's figures of 4.2 mg plus or minus 2%.

Salvini[40] in 1955 concluded that normal persons after receiving edathamil calcium excrete up to 0.5 mg of lead in 24 hours, and in Teisinger's opinion after direct intravenous injection of edathamil calcium urinary excretion of lead in unexposed individuals does not exceed 0.350 mg of lead.

Teisinger in 1956 chose an intravenous dose of 3 gm of edathamil calcium for his diagnostic study as well as for treatment. In his series of 25 cases of chronic lead poisoning the patients were so treated every third day, with a rest period of two days for a series of 10 or 12 courses.[41]

A new route of administration, that by aerosol inhalation, was proposed in 1956 by Teisinger, who added, however, that this method required further study.

Direct Intravenous Injection

A presentation of the diagnosis and treatment of industrial lead poisoning is given by John DeBruin, M.D.,[42] published in 1959 as a doctor's thesis at the university of Amsterdam, Netherlands. Since 1956 DeBruin had treated 30 patients suffering from chronic lead poisoning with edathamil calcium, often administered every other day by intravenous injection, not perfusion by gravity. His daily dose never surpassed 2.4 gm. of edathamil calcium. With this dosage he got a maximum of 22 mg of lead per liter in 24 hours. In none of his cases were there any complaints pointing to kidney damage, and there was no albumin or microscopic abnormality. In his experience, a total dose of 48 gm of edathamil calcium was sufficient to allow all clinical symptoms of lead poisoning to disappear, even though probably not all of the lead was removed from all storage depots. He continues the edathamil calcium treatment until anemia, stippling, and coproporphyrinuria have disappeared completely. His treatment lasts in general from four to six weeks.

Much remains to be studied about the ultimate efficacy and use of this drug in lead absorption. This has been emphasized by Miller,[43] who also states that the drug is considered most useful in the treatment of the acute phase of the illness. In addition Miller says that the principal virtue of edathamil calcium-disodium most likely lies in its ability to expedite the elimination of potentially toxic quantities of lead from the body, and thus one may hope to shorten the period of disability.

Edathamil in Organic Lead Poisoning

In the treatment of lead absorption discussed in this review we have referred thus far only to cases of inorganic lead absorption. In regard to the treatment of tetraethyl or organic lead intoxication, several workers[44, 45] in this field believe that edathamil calcium-disodium offers no definite cure, perhaps because of the different characteristics of lead in organic combination. In any event, no untoward effects of edathamil therapy have been observed in cases of organic lead poisoning so treated.

Analytical Summary

In analyzing the development of the use of the drug edathamil calcium-disodium in 118 cases published in the past 10 years, though not considering some thousands of unpublished cases, it is possible to mark a general agreement for certain definite changing trends, described below (Tables I and II).

Indications—The majority of clinical workers in this field seem to agree as to the effectiveness of edathamil calcium-disodium in increasing urinary lead excretion with the maximum amount reaching about 20 mg per 24 hours. Many also believe that undergoing such treatment seems to rid the body of the most recently absorbed, most easily mobilizable, and, therefore, potentially most dangerous circulating and soft tissue lead.

Most of the reports refer to cases of apparent lead colic, the type which makes up 90% of cases of lead intoxication. There is but little reference in the literature to the specific value of edathamil calcium-disodium in neurological involvement, such as lead palsy, though Brieger has noted some improvement with the drug, and there is a lack of unanimity as to its effectiveness in a full blown case of lead encephalopathy in the adult.

*Table I—Dosage**

	Year	Author	Cases	Route	Hrs. of Duration q. Rx.	Gm EDTA q. Rx.	No. Rx. q. d.	Total Gm q. d.	Days Rx.	Days Rest	Courses	Total Gm
1	1952	Bessman	1	i.v.	?	0.50 to 0.750	3	max. 0.750	1 to 12	4	2	6.5
2	1952	Belknap	3	i.v.	1	1	2	2	5	2	3	30
3	1954	Hardy et al.	3	i.v.	2	3 to 4	1	3	4 to 7	....	1	20 to 24
4	1954	Belknap and Perry	4	i.v.	1	1	2	2	4 or 5	2	3	25 to 30
5	1954	Ruotolo	7	i.v.	?	0.5	1	0.5	4 or 5	1 or 2	1 to 3	3 to 10
6	1955	Wade and Burnum	5	i.v.	1 or 2	0.5 to 2	1	0.5 to 2	6 to 16	....	1	15
7	1955	Rieders et al.	9	i.v.	5	5	1	5	"daily" 5 to 10	7 to 20	2	45 to 55
		9 typical cases reported in 2 series of 37 cases		i.v.	5	4 to 6	1	4 to 6	1	2 to 6	4 or 5	16 to 36
8	1955	Markus and Spencer	3	i.v.	9	2 to 4	1	2 to 4	4	2	2	16 to 32
9	1956	Perrault et al.	1	i.v.	3	?	2	?	4	3	2	?
10	1957	Vogt and Cottier	1	i.v.	?	40	1	40	5	....	1	200
11	1957	Moeschlin	3	i.v.) 0.)	?	2	2	4	?	90, 4	3	17.5
12	1957	Saita	6	i.v.	?	2	1	2	7	8	2	28
13	1958	Leckie and Tompsett	8	i.v.	6	0.5	2	1	4	3, 7 wks	3	12
14	1958	Albahary and Truhaut	9	i.v.	1 min.	0.5 to 1.2	1	0.5 to 1.2	1	2 or 3	8 to 12	4 to 14.4
15	1959	DeBruin	30	i.v.	1 min.	2.4	1	2.4	1	1	20	48
16	1959	Teisinger and Srbova (of 120 cases, 25 cases reported)	25	i.v.	1 min.	3	1	3	1	2 or 3	8 to 12	24 to 36
		Total	118									

*Explanation of abreviations: Rx = Treatment; q = each; d= day; gm = gram(s); hrs = hours; i.v. = intravenous; O = oral.

Another indication for the use of edathamil calcium-disodium is the need for diagnosis. Rieders and Brieger, Leckie and Tompsett, Teisinger and Srbova, and Albahary and Truhaut have thus suggested the use of the drug edathamil as a provocative "diagnostic test" for excessive lead absorption when signs and symptoms are equivocal or difficult to interpret. Thus if after administration of edathamil calcium-disodium intravenously of 70 to 100 mg per kilogram of body weight (Rieders) or only 0.5 to 1.2 gm per case (Albahary) the urinary excretion of lead is greater than the critical "threshold" value of 0.5 to 1 mg of lead per liter in a 24-hour specimen, then probably abnormally large amounts of lead are present in the soft tissue of the individual involved. Such a finding does not of itself, however, make a diagnosis of lead poisoning (Table III).

The urinary lead level of "control" subjects not known to be exposed to lead usually does not exceed 0.30 to 0.65 mg of lead per liter in a 24-hour specimen after Edathamil calcium-disodium.

A third indication for the use of the drug has been recently suggested. Some workers have found it valuable in preventive therapy in cases of lead absorption before disabling lead intoxication occurs. Such prophylactic treatment must never take the place of introduction of basic engineering measures necessary to reduce lead exposure.

Route of Administration—Originally edathamil calcium-disodium was administered only intravenously or intramuscularly, and the intravenous route is still the preferred one. A small number of men claim good results for the oral route, but its value is sharply debated and doubted, however, by Foreman, Kehoe, Brieger, and Belknap. Inhalational therapy has been suggested tentatively by Teisinger and

*Table II—Results of Therapy**

	Year	Author	Initial Symptoms: Colic	Palsy	Enc.	Relieved After Rx of ? Hours	Urinary Excretion of Lead in Mg per 24 Hrs.: Pre-Rx	Max. Post-Rx	Unfavorable Effects: Unpleasant	Toxic: Bone Marrow	Toxic: Renal	Coproporphyrin Permanent Reduction After ? Courses
1	1952	Bessman			1	72 Hrs. of 2nd course	0.150	0.150	....	0	Oliguria	?
2	1952	Belknap	3			12	0.07	7.0 to 11.0	0	1	0	2 or 3
3	1954	Hardy et al.	1	2		?	0.05 to 0.37	1.50 to 13.0	0	0	0	1
4	1954	Belknap and Perry	4			12	0.2	3.5 to 20.88	0	0	0	2
5	1954	Ruotolo	?	?	?	?	0.1 to 0.5	1.2 to 19.6	?	?	?	1
6	1955	Wade and Burnum	5			2 Hrs. to 4 days	0.17 to 0.56	3.6 to 21.1	0	0	0	No conclusions
7	1955	Rieders et al.	3	2	0	24 to 72	0.12	8.0	0	0	0	2
		(these figures typical of two series)	3	1	0	24 to 48	0.08	8.0	0	0	0	2
8	1955	Markus-Spencer	3			1	0.05	5.	0	0	0	2
9	1956	Perrault et al.	1			Rapidly	?	10.	0	0	0	?
10	1957	Vogt and Cottier	1			....	....	....	....	....	Died	....
11	1957	Moeschlin	3						+		2 Died	....
12	1957	Saita	3			?	?	?	0	0	0	2
13	1958	Leckie and Tompsett	1 (6 no symptoms)			?	0.400	5.700	0	0	0	?
14	1958	Albahary and Truhaut	9	0	0	Promptly	0.04	28.	0	0	0	Reduced
15	1959	DeBruin	30			?	?	22.	0	0	0	Reduced
16	1959	Teisinger and Srbova	25	0	0	?	?	15.2	0	0	0	Reduced

*Explanation of abbreviations: Hrs. = hours; Enc. = encephalopathy; Rx = treatment; Max. = maximum; d = days.

*Table III—Normal and Critical "Abnormal" Lead Levels in Urine**

	Year	Author	No. of Cases	Normal Lead Levels in Mg per 24 Hrs: Without $Ca\text{-}Na_2$ EDTA Rx	Normal Lead Levels in Mg per 24 Hrs: After $Ca\text{-}Na_2$ EDTA Rx	Provocative or Diagnostic Dose of $Ca\text{-}Na_2$ EDTA-Ivt.	Critical "Abnormal" Levels in Urine After $Ca\text{-}Na_2$ EDTA Rx in Mg of Lead
1	1943	American Public Health Association		0.08			
2	1949	Kehoe		0.08			
3	1954	Hardy	3		0.09 to 0.65	2 to 4 gm.	
4	1955	Rieders and Brieger				70 mgs. per kg. of body-weight	More than 1.0 per litre in 24 hours
5	1955	Zambrano			never over 0.25	2 gm. per day for 4 days	Over 0.5 in 24 hours
6	1955	Salvini			0.5	1 gm.	
7	1957	Desoille and Truhaut	3	0.02 to 0.45	0.45 to 0.53	2 gm.	0.8 to 1.0 per litre in 24 hours
8	1958	Leckie and Tompsett	8	0.019 to 0.19	0.22 to 0.65	2 gm.	Over 0.65 in 24 hours
9	1958	Albahary and Truhaut	6	0.02 to 0.04	0.43	0.5 to 1.2 gm.	0.8 per litre ("Peak" in 6 hours)
10	1959	Teisinger and Srbova	50	0.03 to 0.1	0.35	3 gm.	No higher than 0.5 per litre ("Peak" in 6 hours)

*Explanation of abbreviations: "normal" refers to individuals; "controls," not known to be exposed to lead; hrs = hours; Rx = treatment; Mg = milligrams; gm = grams; kg = kilograms.

approved in principle by Albahary and colleagues for prophylactic treatment also.

Frequency of Treatment—Hardy, Belknap, and Rieders, as well as others, all found that increased urinary lead excretion fell off from day to day in spite of sustained daily administration of edathamil calcium-disodium, but that after a rest period of five to seven days a new, though lower, peak of excretion was reached. One theory of explanation is that the most easily accessible lead in the soft tissue is rapidly bound by the edathamil and promptly excreted, and that time has to be given to allow the reaccumulation of lead in the soft tissues from the store held more tightly in the bone.

Hence, though at first a five-day course of treatment was followed by a two-day rest period, now the tendency is to treat for shorter periods and "rest" for longer periods. Some treat only 2 days and "rest" 5 days; some, for example, Rieders and Brieger, rest 8 to 10 days, while DeBruin would treat every other day and Teisinger and Albahary about twice a week.

Duration of Treatment—Here we find that there are divergent trends. Each intravenous treatment was continued often only an hour at first, but now many in America and England, on the one hand, advise giving it over a period of 6 to 12 hours, certainly for a minimum of three hours. Improved results with the prolongation of treatment have definitely been the experience of Rieders and Brieger, and Leckie and Tompsett. Several continental workers, on the other hand, like Teisinger, Albahary, and DeBruin, use the immediate or "direct" intravenous injection, requiring usually less than a minute, in preference to the tedious method of intravenous perfusion. They feel that this direct injection is safer and perfectly adequate.

Dosage—The present tendency is toward a smaller single dose, which seems fully as effective and potentially much less toxic. The amount of initial dosage was at first 1 gm per 30 pounds of body weight per 24 hours, or 5 gm for the average 150 pound man. Now some, including Albahary, recommend as little as one tenth of this dose, 0.5 gm (diluted in 10 to 20 cc of isotonic solution). Others say no more than 1 or 2 gm per day, as originally suggested by Belknap. The present reduction in single dosage is reflected in a lower total dose of edathamil calcium-disodium. The present procedure often results in a total dose which may vary between 8 and 20 gm, contrasting with the original total dose often varying between 25 and 45 gm.

Contraindications—At first, contraindications were not apparent, but there has come the impression from a very few isolated cases of excessive duration and dose that one should be conservative in the dose of the drug, certainly whenever there is suggestion of renal pathology. Foreman, who has done most of the experimental work in regard to nephropathy, states, however, that the demonstration of the hazard of possible renal damage occurring with the therapeutic use of edathamil calcium-disodium should not be considered as a cause for stopping the clinical use of the drug, and he indicates that the drug may be used safely in doses of approximately 50 mg per kilogram of body weight (that is, 3.4 gm for a 150 pound man) per day, given even for five days followed by two days of rest, for as much as three such courses. Actually, in more than 100 cases treated with edathamil calcium-disodium, here reviewed, only two patients had any serious renal involvement.

In the light of David's findings in 1959 of temporary bone marrow cell depression following the administration of edathamil calcium-disodium in rather heavy doses to 3 patients with severe lead poisoning, Belknap's warning in 1952 of a possible though transient depression of white cells based on one case seemed somewhat justified. No other investigator, however, has reported any harm to the bone marrow.

Determination of the Adequacy of Treatment—The search for a simple and practical measure of adequate deleading has been pressed continually. The eventual disappearance of coproporphyrin III from the urine, as measured qualitatively, has seemed to be a more and more helpful index to show when no more deleading treatment is indicated. Both Belknap and Elkins believe that this reduction in coprophyrinuria is a sufficient index of therapeutic adequacy, as do Harrison and Chisholm and most other investigators.

To be sure, for the ideal determination of adequacy of treatment, certainly all would agree that the whole clinical picture of lead poisoning should show complete recovery for at least one year, evidenced by entire relief of symptoms, with absence of clinical signs of lead absorption, as shown by the disappearance of lead line of the gums, definite improvement of the hemoglobin anemia, sharp reduction in the large number of stippled red cells, and eventual disappearance of abnormal amounts of lead in the urine, measured quantitatively, together with the final disappearance of coproporphyrin from the urine.

The 10 years' published experience, here assembled, of treatment of inorganic lead ab-

sorption in the adult with edathamil calcium-disodium must point the way to further investigation, both laboratory and clinical, on the hospital wards and in industrial medical services, directed to the further improvement of the diagnosis, treatment, and eventual prevention of industrial lead absorption.

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Industrial Medical Association

THE PRESIDENT'S MESSAGE

GRADIE R. ROWNTREE, M.D.

IN HIS 1961 Sappington Memorial Lecture at the Los Angeles IMA annual meeting, Dr. Rutherford T. Johnstone asserted that "no other specialty in medicine is *more relative* to the socioeconomic structure of our time than is occupational medicine." He was deploring the fact that our medical specialty is not permitted to participate fully in undergraduate education. But his statement, by indirection, pointed up a perhaps more immediate concern.

It is the need for providing occupational medical services for the 80% of workers employed in small business. (I speak of small "business" rather than "plants"—*any* business employing from, say, 25 to 200 persons.) For the foreseeable future, it is the physician in private practice who mainly must meet this particular medical need. How can we encourage him to do so?

Our history in this specialty is one of accomplishments by dedicated physicians working to broaden the concepts of occupational medicine. Why, therefore, cannot each of us be an emissary in his own community to develop the interest of our private-practice colleagues in this small business field?

As a first step, we could work closely with the occupational medical committee of each state medical society. Where there is an IMA component society in the state, its meeting could be held, beneficially, in conjunction with the annual state medical meeting. Where there is no component society, the counselor or individual member can be effective. In creating this interest, our members might well develop the nucleus for a new component society. And an active society fosters public interest.

Further, it seems to me, we could interest members of specialty societies—surgery, orthopedics, internal medicine and perhaps most importantly the Academy of General Practice —in the occupational medicine field. From these groups and others must come the physicians who will establish occupational medical care programs in small companies.

Our basic mission is simple: See to it that such physicians understand the concepts of modern preventive occupational medicine; show them how to supervise and administer suitable programs for these smaller groups of employees. Seminars and speakers on occupational medicine at local, county, and state medical group meetings provide one obvious method of doing this. Other methods will readily suggest themselves.

For creating an active interest in occupational medicine there is, of course, no substitute for the local organization dedicated to this field. An ideal situation would be the founding of a component society in every state. Probably every state has at least 25 physicians doing some work in occupational medicine who would be interested in belonging to a local society devoted to this specialty. Counselors in states having no component societies should have the willing help of other IMA members in interesting physicians in membership, first in our association itself and then in a component society. States having as many as 25 members of IMA need delay no longer in founding a component society.

Physicians in private practice who do some work in industrial medicine need the Industrial Medical Association; need to know more of the principles of present-day industrial medical practice as set forth by our organization. As a practical matter, if each member of IMA *this year* interested one other physician in his community in membership, our ranks could reach 8,000! And there would be diminishing grounds for Dr. Johnstone's question, "Why is it that even today not only laymen but also those within the medical profession ask, 'What is occupational medicine?'"

Book Reviews

RADIATION, GENES, AND MAN. Wallace Bruce and T. H. Dobzhansky. Price. $3.50. Pp. 203, with 19 illustrations. Henry Holt & Company, 383 Madison Ave., New York 17, N. Y., 1959.

By ROBERT T. MANNING, M.D.

Wallace and Dobzhansky have succeeded admirably in carrying out the proposals outlined in the preface to their book on "Radiation, Genes, and Man." Although I disagree with their statement in the preface regarding justification for another book on genetics, they have admirably justified the publication of this small volume through its thoughtful and penetrating content and comment upon the present status of this most fascinating and important subject.

A brief introduction is given to the subject of genetics and the reader is led step by step through the significant information needed to understand the subsequent chapters regarding radiation and mutation. The information regarding atoms and radiations is perhaps a little too brief for one unfamiliar with the subject, but it suffices to provide some familiarity with terms. The only major error I discovered occurred in chapter 4, "Atoms and Radiation," p. 65. The statements regarding the neutron capture by sodium and its subsequent disintegration into iron and an alpha particle are incorrect. The stable isotope of sodium has an atomic number of 11 and molecular weight of 23. The capture of a neutron by this material, itself an unlikely phenomenon, would lead not to the production of iron but of magnesium-24, also a stable isotope. It is also impossible that iron would quickly change into neon as stated. Other than this, I found no other mistakes and uncovered no gross typographical errors.

The real meat of the book is contained in chapters 6 through 8 which require careful perusal if the reader is abreast of the authors' thought processes. These are not chapters to be casually or lightly read, but require thought and study to obtain the information contained therein. This should not deter anyone not familiar with the subject from reading the book, but simply is warning that some reader-effort is required to make the information useful. Chapter 9 sets out a concluding survey of the problems as the authors see them regarding the potential of radiation damage and of human eugenics and an eminently satisfactory epilogue.

Wallace and Dobzhansky have produced a most satisfactory and thought-provoking little book which is attractively published and well within the price range of the average reader. I recommend it highly to any member of society who has given any thought at all to the potential and proved dangers of the radiation to himself and to his progeny. The authors bend over backward to present both sides of the over-all questions, but, even so, their arguments are more forceful for being unwritten than if they had become partisan in their dissertation.

Dr. Manning is an Associate in Medicine on the faculty of the University of Kansas School of Medicine, Kansas City, Kansas.

CLINICAL PULMONARY PHYSIOLOGY. Ed. 2. Board of contributors headed by Burgess L. Gordon, M.D. Price, $28.50. Pp. 1,013, with 728 illustrations. Grune & Stratton, Inc., 381 Fourth Ave., New York 16, N. Y., 1960.

By CAPT. H. J. ALVIS, MC, USN

This compilation of 63 chapters by 93 contributors produces a book of 1,013 pages of easily readable print on high-grade paper. The 728 illustrations are carefully selected and well reproduced. This is a second edition under this title sponsored by the American College of Chest Physicians and is an extensive revision and enlargement of the earlier work. As the title implies, the emphasis is on the physiologic basis of chest disease. A unique final section of 67 pages and 25 illustrations covers the subjects of air pollution, aviation physiology, thermal stress, underwater physiology, and blast biology. The list of contributing authors is sufficient endorsement of the merit of the work.

Capt. Alvis is Staff Medical Officer, Submarine Force, Pacific Fleet. He is an abstracter of literature in his field for this journal.

PHYSIOLOGY IN INDUSTRY—EVALUATION OF INDUSTRIAL STRESSES BY THE PHYSIOLOGICAL REACTIONS OF THE WORKER. Lucien Brouha, M.D., D.Sc., and John A. Zapp, Jr., Ph.D. Price, $6.50. Pp. 145, with illustrations. Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y., 1960.

By JAMES P. HUGHES, M.D.

The name of Dr. Lucien Brouha has long been favorably known in management and industrial engineering circles, especially in North America and in Europe. Presently affiliated with Du Pont's Haskell Laboratory, he moves with professional ease among engineers as well as physiologists and industrial physicians. He states with an impressive authority that is derived from the thoughtful analysis of his rich experience in industry: "An engineer would not use a machine without knowing its characteristics . . . Strangely enough, when the problem is the use of the human machine as a source of mechanical energy, the attitude changes. . . . Physiological energy expenditure must be measured because it is the only accurate means of evaluating the effort of the worker and of estimating the degree of his fatigue. These measurements are the key to the solution of the problem of what a man can do safely, but they are still ignored in industrial practice."

In these 145 pages of concise description and well-tabulated data, the author reviews the highlights of his years of careful clinical and environmental observations on men at work, both in the industrial plant and in the stress laboratory.

The three sections concern the worker—the physiology of muscular contraction and cardiovascular function; the environment—with emphasis upon the evaluation of heat stress (and a discussion of the assessment of the chemical environment, prepared by Dr. John A. Zapp); and the job—with a review of methods for the evaluation of its physiologic requirements, and a valuable section on engineering methods and work scheduling recommended for the reduction of heat stress and fatigue.

The author describes a method for the construction of recovery curves of heart rate following work sequences, and for the determination of the total cardiac cost of different jobs. The value of physiologic measurements performed at the job site, rather than solely upon the laboratory treadmill, is emphasized. Then, after a summary of principles, Dr. Brouha presents the results obtained from the in-plant study of a typical job of materials handling in a manufacturing operation. By the case method, he describes the application of his technique for the evaluation of human effort. The result in this case was the reorganization of the job, finally achieving maximum productivity and efficiency at minimum physiologic cost.

In a striking introduction, Mr. J. B. White, Vice President and General Manager of Aluminum Company of Canada, Ltd., writes "During the Second World War, Doctor Brouha was one of the experts our Company employed to guide us in determining satisfactory working conditions and the amount of work which may fairly be associated with job satisfaction. Doctor Brouha used our smelters for his laboratory and our men as his experimental subjects. He experienced with them the physical and environmental demands of their jobs, and, in his warm and understanding manner, became familiar with their feelings and attitudes about their employment. They came to believe in the fairness and suitability of his recommendations regarding their work loads and the conditions of work. Their belief in him is illustrated by the fact that their associated unions engaged him to make studies in other industries on their behalf. Likewise, we came to respect his insight into the relationships between men and their work environment. He demonstrated skill in working out procedures to reduce work effort without sacrificing work output. He staunchly upheld both sides of the labor-management team. He helped remove unjustified suspicion and promoted joint co-operation in solving industrial problems."

That is a fitting tribute to a man whose studies have greatly advanced our knowledge of work physiology, and whose career has enhanced the standing of the health professions in their relation to industry.

This little book is one to excite the imagination of all of those who devote themselves to the biologic study of man at his work. It deserves wide distribution among students and practitioners of the several scientific disciplines that contribute their efforts toward the achievement of occupational health. It also should find many readers among industrial engineers and management people who are concerned with setting performance standards for production jobs. It is especially recommended to the plant physician who is responsible for the health maintenance of men who work at heavy tasks in a hot or humid environment.

Dr. Hughes is Medical Director, Kaiser Aluminum & Chemical Corporation, Oakland, Calif., and a director of the Industrial Medical Association.

ANNUAL REVIEW OF MEDICINE. Volume 11. David A. Rytand, Editor, Stanford University School of Medicine. William P. Creger, Associate Editor, Stanford University School of Medicine. Price, $7.00. Pp. 453. Annual Reviews, Inc., Palo Alto, Calif., 1960.

By EUGENE L. WALSH, M.D.

The current volume of this established annual review maintains the high quality of selection and coverage of subjects in medicine as established in preceding editions. Each of the 23 authors authoritatively reviews his subject assignment with a brief introduction, integrated into a discourse emphasizing the recent developments in his assignment. Thus, each chapter permits an excursion into a well-covered specialty area. In the 402 pages of text, about 3,000 references are cited and reviewed in narrative form in perspective. This form of reporting is certainly one of the best approaches to coverage of the ever-increasing literature for the busy clinician. Whether it be for knowledge in the general field of medicine or for leisure literary browsing in little frequented professional fields of interest, this volume is ideal. Most of the major segments of medicine are covered and, as one scans the 10 pages listing the coverage in previous issues, one finds, indeed, a consistent depth and quality in selection of material and essayists. The author and subject index of the current volume of 40 pages provides for immediate location of topics.

This volume should be a part of the growing library of every internist.

Dr. Walsh is Director of Medical Services, International Harvester Company, Chicago, Ill.

Publications Available

The following list of publications has been compiled on the basis of probable interest to the readers of this Journal and is presented solely for the purpose of giving notice of their availability.

Handbook of Pediatrics. Henry K. Silver, M.D.; C. Henry Kempe, M.D.; and Henry B. Bruyn, M.D. Price, not given. Pp. 573. Lange Medical Publications, Los Altos, Calif., 1961.

Handbook of Surgery. Edited by John L. Wilson, M.D., and Joseph J. McDonald, M.D. Price, not given. Pp. 644. Lange Medical Publications, Los Altos, Calif., 1960.

Fundamentals of Modern Allergy. Edited by Samuel J. Prigal, M.D. Price, $18.50. Pp. 690, with illustrations. McGraw-Hill Book Company, Inc., 33 W. 42nd St., New York 36, N. Y., 1960.

Questions

The questions published in this column are edited versions of requests for information that have been received during recent months. The answers have been prepared by one or more competent authorities in the particular area covered by the question. Readers may address questions to the Editor.

Question: *What is the preferred method of treatment for concentrated hydrofluoric acid burns?*

Answer: Historically the treatment of HF burns has included silver nitrate, tannic acid, zinc oxide, and then magnesium oxide paste. In addition, 10% calcium gluconate injections have been used for subungual burns. At present the method of choice seems to be the use of iced quaternary ammonium compounds. Hyamine, Phemeral (benzethonium), and Zephiran (benzalkonium) are all effective when used on such burns. These may be applied as an alcohol solution of 2 gm of Hyamine per liter of 70% denatured alcohol, or an aqueous solution of 2 gm of Hyamine per liter of distilled water. Because of the considerable foaming when shaking to dissolve the Hyamine, a quantity of solution should be made up in advance.

Persons who have contact with HF should be showered immediately with copious amounts of water. Contaminated clothing should be removed as quickly as possible. Treatment on the spot following washing may consist of the application of magnesium oxide ointment consisting of 3 oz. of magnesium oxide powder and 4 oz. of heavy mineral oil with 11 oz. of white petrolatum. This should be used if there is any delay anticipated in obtaining medical attention. Any burned areas should be soaked in iced aqueous or alkaline Hyamine solution for one to three hours depending upon the appearance and extent of the burn.

Subungual burns may be treated by splitting the nail from the distal end in order to allow free drainage. Iced Hyamine soaks give at least equal results to those of injections of 10% calcium gluconate around and beneath the nail.

Alternate Answer: When the patient arrives at the dispensary, the affected areas are soaked in a saturated water solution of magnesium sulfate and ice. This is continued for about 15 minutes. All severe burns are injected with calcium gluconate solution immediately and then wet soaks or compresses are continued. A long, fine-gauge needle is used to inject a 10% calcium gluconate solution subcutaneously in the area of the burns. After the injection the burned area is dressed using a special burn ointment which contains procaine, Epsom salts, and magnesium oxide in a suitable base.

Letters

TO THE EDITOR: While conducting surveys recently for an industrial hygiene study of coal mines in Pennsylvania, a somewhat interesting sidelight arose aside from the purely technical aspects of the survey. This had to do with the use of mules in some mines for underground haulage. This—in these modern times of mechanization and automation! It came as a surprise to some of the industrial hygienists who had never heard of this before. Naturally their experience with the mules was limited, as they were not there to make a study of the use of mules; but some observations were made, and, of course, various comments and stories about them were forthcoming from the miners, some of these possibly exaggerated. Some of these stories may be of interest.

The mules are brought into the mine at about the age of 2 years. They are housed in an underground stable very similar to one above ground, with cement floors, feeding bins, electric lights, shoeing facilities, and even cats! When they become ill or are injured they are placed under the care of a veterinarian and are treated either in the stable or taken to pastures above ground. Incidentally, this is about the only way the mules ever get out of the mines at all before they die. The rumor that this never leaving the mine causes them to go blind was discounted by the mine people. The most frequent illnesses or diseases they get are respiratory infections and arthritis and neuritis.

The mules are only occasionally worked more than one shift at a time, hauling from 8 to 15 miles on a shift. They pull anywhere from one to six or eight mine cars from the breasts or chutes to the main haulageway. They quickly learn how many cars they can or are expected to pull and thereafter can hardly be budged if any extra ones are slipped onto them. The mules get to know the mine very exactly, even in the darkness. They step on a weak or broken track board only once or twice, and every time after that they step over it.

A mule almost always works with the same miner, so that they get to know each other quite well. The miners drive the mules to a large extent by voice commands and they seem sometimes to have a language of their own, complete with epithets and expletives.

The foregoing might be called an item of "human interest" in connection with an industrial hygiene coal mine survey!

—LEROY O. PLETZ,
Industrial Hygienist
Division of Occupational Health
Pennsylvania Department of Health

Abstracts of Current Literature

Industrial Hygiene Controls

Air Pollution Standards. V. G. MacKenzie.* Arch. Environ. Health 2:224 (March) 1961. (*Division of Air Pollution, U.S. Public Health Service, Washington, D.C.)

Standards will become increasingly important in the study and control of air pollution. The author makes a plea to resist "the temptation to establish legal standards," for he believes that standards should be kept within the informal realm of scientific and technical opinion until many more of the gaps in our present knowledge have been filled. Within this concept, nonlegal standards would be workable guides and would serve as useful benchmarks in all aspects of a control program.

Two types of standards are discussed: (*a*) emission standards and (*b*) ambient air standards. The relationship of these toward the eventual development of community air pollution control programs is emphasized.

The ambient air standards of three levels of pollution as developed by the California State Health Department are reviewed. These levels are termed adverse, serious, and emergency. The adverse level indicates sensory perception, changes in vegetation, or reduction in visibility. The serious category contains levels of pollutants which would alter body function or are considered likely to cause a chronic disease. The emergency category indicates levels that are "likely to cause acute sickness in sensitive groups of people." California has promulgated specific standards limited to chemicals about which the state of knowledge was adequate. Other standards will be developed as more knowledge is obtained.

—L.W.S.

Coproporphyrinuria in Groups of Workers as an Index of Inorganic Lead Absorption. R. L. Zielhuis.* Brit. J. Indust. Med. 18:58 (Jan.) 1961. (*Netherlands Institute for Preventive Medicine, Leyden)

This study attempts to correlate the concentrations of lead in air with the urinary coproporphyrins and the hemoglobin values in various groups of exposed workers.

Using the Donath method and scale of semiquantitative determination of coproporphyrin, the author draws some conclusions for the practice of industrial hygiene: (1) If the average exceeds 1.5°, there is an increased lead intake. (2) If the average is between 1.5° and 2.5°, the exposure is allowable. (3) If it exceeds 2.5°, the allowable concentration for lead in air (0.1 mg Pb/m^3) has probably been surpassed. (4) The degree of air pollution with lead and the degree of anemia resulting may be roughly estimated from the coproporphyrinuria groups of workers numbering 20 or more. High-exposure areas may be discovered by plotting data on floor plans.

Although coproporphyrinuria is a nonspecific finding, normal excretion generally indicates absence of increased lead absorption, and it is more sensitive than either basophil stippling of erythrocytes or depression of hemoglobin. —E.C.R.

Benzo(a)pyrene Content of the Air of American Communities. E. Sawicki,* W. C. Elbert, T. R. Hauser, F. T. Fox, and T. W. Stanley. Am. Indust. Hyg. A. J. 21:443 (Dec.) 1960. (*Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio)

This study in air pollution research has been carried out in conjunction with various state and city air poilution agencies throughout the country. In view of the definitely proved ability of this chemical to produce cancer in animals, it was felt that perhaps evaluation of the concentration in air-borne particulates might provide a useful index which, when studied with reference to the incidence of lung cancer, might suggest an etiological agent.

"Examination of benzpyrene content in the air of 131 urban and nonurban areas in various parts of the country has disclosed that benzpyrene is universally present." Since this study was carried on the benzene-soluble fraction of air-borne particulates, there is a relationship between the concentration of air-borne particulates and the benzpyrene fraction. The amount of particulates in the air, however, is not affected as greatly by the season as is the benzpyrene concentration. Even when the milligrams of particulates per 1,000 cubic meters of air remain relatively constant throughout the year as occurred in Cincinnati, Ohio, in 1958 and 1959, the concentration of benzpyrene per gram of particulates and per 1,000 cubic meters of air showed a very definite seasonal fluctuation, increasing in the latter part of September and remaining elevated through April. A similar trend was shown in Philadelphia, Pa.

The authors have presented a map based on studies carried out from January through March, 1959, showing the concentrations of benzpyrene in micrograms per 1,000 cubic meters of air for all urban and nonurban sampling sites indicated on a map of the United States. "The lower concentration of benzpyrene in the particulates and in the air of California communities may be attributed to less winter heating, use of liquid and gaseous fuels, and in addition may be due to the action of California sunshine and oxidizing atmosphere." Seven tables and six figures illustrate the article. —E.C.R.

Rocket Propellants. H. M. Bowman.* Arch. Environ. Health 2:293 (March) 1961. (*Thiokol Chemical Corp., Denville, N. J.)

Bowman points out the need for unusual safety and health precautions in carrying out research

on rocket propellants. He makes clear that not only are adequate facilities necessary but the personnel have to be taught to think and act safely. The extreme toxicity of many of the reactive chemicals handled in a program of this sort alone would be enough to discourage many investigators. To this are added a number of additional hazards "such as detonation, spontaneous ignition, and corrosion. For example, some of the boron hydrides are so reactive to air (pyrophoric) that when they leak from a processing system they usually burn and sometimes explode." In spite of the many hazards, the author feels that the field of rocket propellant research and development can be as safe as any other field of chemical research if everyone thinks and lives "safety." —E.C.R.

Noise and Hearing

Post-Tetanic Potentiation in the Middle-Ear-Muscle Acoustic Reflex. F. Simmons.* J. Acoust. Soc. America 32:1589 (Dec.) 1960. (*Stanford University Medical Center, Stanford, Calif.)

Reflex activity of the middle ear muscle was measured by utilizing chronic electrode implants in cats, indirectly by means of round-window electrodes and directly (barring artifacts) by means of electrodes inserted into the muscles. It is shown that detectable muscle potentials can be detected at levels about 20 db below those required to produce a visible reduction in the cochlear-microphonic oscillographic trace. Immediately following stimulation for from five seconds to two minutes by white noise at 80 to 90 db SPL, a much lower (by 7 to 40 db) level was required to produce detectable muscle potentials (no mention is made of any changes in level at which cochlear-microphonic reduction appears). The results are said to be due to post-tetanic potentiation, an apparent increase in neural sensitivity following intense stimulation. —W.D.W.

The Tympanic Muscles and Their Reflexes: Physiology and Pharmacology with Special Regard to Noise Generation by the Muscles. R. Wersäll.* Acta Oto-Laryng., Supp. 139, 1958. (*Department of Otolaryngology, University of Uppsala, Sweden)

In the extensive studies described in this monograph, acoustic-reflex activity was studied directly (barring artifacts) by measuring changes in tension of the stapedius and tensor tympani muscles in rabbits and cats by means of a mechanico-electronic transducer. Some of the results are these: (1) The tensor tympani never contracts at a lower sound intensity than the stapedius, indicating that stapedius activation is necessary for tensor tympani contraction. (2) Fluctuations in measured tension (the fluctuations have a frequency of 14-25 cps) during sustained activation are shown not to be due to a feedback loop whereby the activating sound at the cochlea induces contraction, is thereby reduced, so decreasing the contraction, allowing the sound to again increase, etc. (3) Under continuous stimulation, the tension gradually decreases to a steady-state value. (4) After such adaptation, several seconds of silence must elapse before the same tone can elicit contraction as strong as that observed initially. (5) The adaptation, however, is quite frequency-specific; that is, after adaptation to one frequency changing to another will give a new contraction nearly as great as the original one. —W.D.W.

Studies on the Acoustic Stapedius Reflex in Man: Measurements of the Acoustic Impedance of the Tympanic Membrane in Normal Individuals and in Patients with Peripheral Facial Palsy. O. Jepsen.* Thesis, University of Aarhus, Denmark (1955). (*University Ear Clinic, Aarhus, Denmark)

After a review of the literature on the acoustic reflex, the author describes some experiments on normal persons and on those with peripheral facial palsy (Bell's palsy) using as an indicator of reflex activity the change in acoustic impedance. The results using normals indicate that the reflex threshold (the sound pressure level necessary to evoke the reflex) changes only slightly with age, despite gradually increasing hearing loss. Most of the patients with facial palsy, as well as those with surgically severed facial nerves, showed no acoustic reflex, which indicates that the stapedius must be normal in order for either the stapedius or the tensor tympani to contract. Phonophobia (an abnormally low threshold of discomfort or pain) was found only in patients with stapedius paralysis, although not all patients with paralysis showed phonophobia. Where present, phonophobia began at the level at which the reflex normally would start to be activated. —W.D.W.

A Study of the Effects of Loud Sound on Tinnitus. G. F. Reed* and M. A. Christian. Laryngoscope 71:167 (Feb.) 1961. (*Department of Otolaryngology, Massachusetts Eye and Ear Infirmary, Boston, Mass.)

According to anecdotal reports, chronic tinnitus has sometimes been relieved temporarily and even permanently by exposure to high-intensity noise. This experiment was designed to determine more scientifically what effects on tinnitus could be produced by treatment with high-intensity sound and what portion of these effects are due merely to suggestibility of the patients. A group of 100 patients was divided into two groups matched in age, sex, duration and character of tinnitus, and neuroticism. The experimental group was exposed on three occasions for 10 minutes each to a pure tone near the tinnitus frequency at 120 db SPL or higher. The control group went through the same procedure but with no acoustic stimulation (they were told that the exposure

involved a tone too high in pitch to hear). It was found that the tonal exposure could either alleviate (in 25 of the 50 cases) or intensify (in 13) the tinnitus, but in either case the effect was only temporary. Although fewer changes in tinnitus were reported by the control group (better in 11 cases, worse in 4), these numbers are high enough to indicate the importance of suggestion. Strangely, neuroticism seemed to be irrelevant. The authors conclude that, if there were some way to control the psychological influence of intense sound, the paradoxical effect might well be shown to be due entirely to suggestion. —W.D.W.

Experimental Toxicology

The Effects of Continuous Exposure of Animals to Ethanolamine Vapor. M. H. Weeks,* T. O. Downing, N. P. Musselman, T. R. Carson, and W. A. Groff. Am. Indust. Hyg. A. J. 21:374 (Oct.) 1960. (*U.S. Army Chemical Warfare Laboratories, Army Chemical Center, Maryland.)

Continuous exposure (24 hr/day, 7 days/wk for periods up to 90 days) of dogs, guinea pigs, and rats to 12 ppm or higher concentrations of monoethanolamine vapor caused behavioral changes (excitation followed by depression) and skin irritation. Exposure to very high concentrations (66-102 ppm) induced lung inflammation and liver and kidney damage and caused death. Minimal effects were induced at 5 ppm; a narcotic effect would be anticipated for man continuously exposed to this concentration. Odor was detectable by human subjects at 25 ppm, and a concentration on the order of 3 ppm was sensed even though odor was not discernible. Intermittent exposures reported previously in the literature indicated a lower order of toxicity than observed in these continuous exposures. —R.E.E.

Toxicity Studies with Octafluorocyclobutane. J. W. Clayton Jr.,* M. A. Delaplane, and D. B. Hood. Am. Indust. Hyg. A. J. 21:382 (Oct.) 1960. (*Haskell Laboratory, Wilmington, Del.)

Rats sustained a 4-hour and mice a 10-minute single exposure to an 80% octafluorocyclobutane /20% oxygen mixture without evidence of anesthetic or other toxic effects. In dogs, rabbits, rats, and mice exposed to an atmosphere containing 10% octafluorocyclobutane six hr/day, five days/wk for a minimum of 90 exposures, there was likewise no evidence of toxic effects. It is concluded that the gas can be used safely as a food propellant. —R.E.E.

Studies on the Toxicity of Triethylborane (TEB). W. E. Rinehardt.* Am. Indust. Hyg. A. J. 21:389 (Oct.) 1960. (*University of Pittsburgh, Pittsburgh, Pa.)

The oral and intraperitoneal LD_{50}'s for the rat were found to be 235 and 22.7 mg/kg, respectively, for triethyl borane. The four-hour LC_{50} for the rat was 700 ppm. Respiratory irritation was evident in the inhalation study, and a CNS effect (convulsions) in the other studies. In inhalation studies on the combustion products, no toxic effects were seen (calculated B_2O_3 content ranged from 0.25-1.12 mg/liter and CO_2 content from 394-1, 750 ppm, over exposure periods ranging from 30-240 min). The author concludes that until further studies are conducted, exposures to triethyl borane should be kept to a minimum. —R.E.E.

Photosensitivity and Heat. R. L. Lipson* and E. J. Baldes. Arch. Dermat. 82:517 (Oct.) 1960. (*Mayo Foundation, Rochester, Minn.)

A study in white mice demonstrated that heat which is harmless to normal animals can be quite harmful or even lethal to photosensitive animals. It is suggested that all photosensitive patients be cautioned against supposedly harmless heat exposures such as hot baths, heat lamps, hot stoves, etc. —R.E.E.

Acute and Subacute Toxicity Studies of Thallium Compounds. W. L. Downs,* J. K. Scott, L. T. Steadman, and E. A. Maynard. Am. Indust. Hyg. A. J. 21:399 (Oct.) 1960. (*University of Rochester, Rochester, N. Y.)

The seven-day LD_{50} for thallous acetate (TA) by intraperitoneal (IP) injection in rats was 23 mg Tl/kg. Lethal IP doses for the rat, rabbit, and guinea pig ranged from 7-20 mg Tl/kg. The oral seven-day LD_{50} for the rat was 32 mg Tl/kg. Lethal oral doses for the rat, rabbit, guinea pig, and dog ranged from 20-30 mg Tl/kg. For thallic oxide (TO) the seven-day LD_{50} by IP injection in rats was 72 mg Tl/kg. Lethal IP doses for the rat, rabbit, and guinea pig ranged from 30-92 mg Tl/kg. The oral seven-day LD_{50} for the rat was 39 mg Tl/kg. Lethal oral doses for the rat, rabbit, guinea pig, and dog ranged from 5-30 mg Tl/kg. By the IV route in rabbits, the lethal dose for TA was 20 mg Tl/kg, and for TO it was 39 mg Tl/kg. Rats fed dietary levels as low as 0.003% TA or 0.0035% exhibited marked growth depression after 30 days. The major clinical finding was an almost complete depilation. Aside from atrophy of the hair follicles and sebaceous glands in the skin, there were no pathologic changes in other organs attributable to the ingestion of thallium. The kidney was the principal site of deposition. —R.E.E.

Use of Porous Synthetic Sponge (Ivalon) in Surgery: I. Tissue Responses After Implantation. R. H. Adler* and C. Darby. U.S. Armed Forces M. J. 11:1349 (Nov.) 1960. (*University of Buffalo School of Medicine, Buffalo, N.Y.)

Studies in rabbits suggest that Ivalon (formalinized polyvinyl alcohol) loses most of its desirable features after implantation in the animal body. Uncompressed sponge becomes fragmented and partially dissolves. Highly compressed sponge loses porosity, has less fibrovascular infiltration, and becomes surrounded by a thick fibrous cap-

sule. This suggests that its carcinogenic potential cannot be ignored. It is poorly tolerated in the body in the presence of infection. In general, it appears to have very limited value in clinical surgery today. —R.E.E.

Internal Medicine

Bagassosis—Peculiarities of Its Geographical Pattern and Report of the First Case from Peru and Puerto Rico. H. A. Buechner.* J.A.M.A. 174: 1237 (Nov. 5) 1960. (*Tulane University, 1601 Perdido St., New Orleans, La.)

Bagassosis until recently has been considered a medical curiosity but now must be considered an occupational disease of increasing importance.

Bagasse is dried sugar cane fiber. The disease, bagassosis, followed an odd distribution among factories where there was contact with bagasse. Sixty sugar mills seasonally grind cane and produce bagasse; yet only two of these and two manufacturing plants to which they supply bagasse were the source of the disease. The explanation of this oddity appears to be that moisture-laden bagasse immediately after production by cane-grinding or exposure to freshly baled material is harmless, but exposure to baled bagasse that has been stored and dehydrated apparently is capable of producing the disease. This may not be the entire explanation; further study is indicated.

Buechner reports a case in detail. It is of interest that the initial chest x-ray film showed an infiltration in the right upper lobe, and tuberculosis was considered. Subsequently, there were diffuse, mottled densities throughout both lungs. Eventually, these miliary densities regressed, and the lungs appeared approximately the same as before the onset of the disease.

The author urges that bagassosis no longer be considered a rarity. Physicians dealing with patients working in paper mills and wallboard manufacturing plants using bagasse should consider this entity when confronted with respiratory symptomatology. —S.H.S.

Two Cases of Sarcoidosis Treated with Mepacrine. N. Söderström.* Lancet II:947 (Oct. 29) 1960. (*Karlstad Central Hospital, Karlstad, Sweden)

In Scandinavia, sarcoidosis presents a major problem. Söderström describes two cases which may indicate a new approach to therapy, namely, the use of mepacrine or some other antimalarial drug, such as chloroquine. During World War II, mepacrine was useful in the treatment of discoid lupus erythematosus; it has been abandoned in favor of chloroquine and others because the latter are less toxic and skin pigmentation is lessened.

The two cases presented here had cutaneous sarcoid, that is, a rash of medium-sized firm brown-red papules, which are the sarcoid granulomas. In addition, both cases had other manifestations such as lymph-node sarcoidosis and sarcoidosis of the nasal mucosa. Both were treated with mepacrine. The drug seems to have a special affinity for the cells of the granuloma and acts on them rather than on the unknown causal agent.

Treatment with mepacrine in these two cases converted the cutaneous sarcoid granulomas into atrophic scars in one month. The other manifestations of sarcoidosis, that is, the lymph-node involvement and that of the nasal mucosa, disappeared at the same time. —S.H.S.

Effect of Cortisone on Hypercalcemia in Sarcoidosis. A. A. Goetz.* J.A.M.A. 174:380 (Sept. 24) 1960. (*596 S. Carroll St., Sunnyvale, Calif.)

Apparently, hypercalcemia is the underlying factor in renal insufficiency in sarcoidosis and is not due to granulomatous involvement of the kidney as was previously supposed. Hypercalcemia has been estimated to occur in 20%-30% of the cases, and recently it has been noted that hypercalcemia is more frequent in sarcoids in male subjects.

Any disorder with hypercalcemia causes dry mouth, anorexia, nausea and vomiting, vague abdominal pain, constipation, and pruritus. The characteristic laboratory findings in sarcoidosis are elevated blood and urine calcium levels, normal or elevated serum inorganic phosphorus levels, normal serum alkaline phosphatase, and low fecal calcium.

Hypercalcemia must be differentiated from other diseases, such as vitamin D intoxication, milk-alkali syndrome, hyperparathyroidism, multiple myeloma, osteoporosis, and metastatic carcinoma. The author differentiates these conditions clearly.

A patient with sarcoidosis may present himself only with symptoms referable to the eyes (corneal calcifications) or renal manifestations (nephrocalcinosis or insufficiency). Early recognition of such cases is important, since prolonged steroid therapy may prevent severe ocular damage and permanent renal impairment. —S.H.S.

Infectious Hepatitis: Studies on the Effect of Gamma Globulin on the Incidence of Inapparent Infection. S. Krugman,* R. Ward, J. P. Giles, and A. M. Jacobs. J.A.M.A. 174:823 (Oct. 15) 1960. (*550 First Ave., New York, N. Y.)

This study may be of great importance in helping to establish the optimum dose of gamma globulin in the prevention of hepatitis.

The authors discuss the incidence of inapparent infection and the incidence of second attacks. Second attacks occurred in 4% to 8%, the interval between the first and second attacks being about 1½ to 21 months. Four theories are advanced as to the reason for second attacks: (1) Multiple immunologically distinct types of infectious hepatitis virus may be present; (2) the virus may be latent in liver cells or elsewhere; (3) the primary infection may be in a smoldering state; (4) the second attack may be due to an enormous dose of virus.

Abstracts

The attack rate for clinically inapparent hepatitis for the first six months following admission to the institution where this study was undertaken was 60%; the attack rate for overt hepatitis was about 5%.

The administration of 0.01 ml of gamma globulin per pound of body weight resulted in 2½-fold reduction in incidence of hepatitis with jaundice in children. The same dose was ineffective in adults; however, 0.06 ml per pound of body weight resulted in a 10- to 30-fold reduction in incidence in overt hepatitis. The authors conclude that the optimum dose of gamma globulin for the prevention of hepatitis is 0.06 ml per pound of body weight in children and adults. —S.H.S.

Radiation Health

Public Protection in an Open Exhibit of Radioactivity. W. B. Harris.* Arch. Environ. Health 1:377 (Nov.) 1960. (*Health and Safety Laboratory, U.S. Atomic Energy Commission, New York, N. Y.)

The Health and Safety Laboratory of the Atomic Energy Commission at New York City was given responsibility for radiation protection and safety at the 1958 United Nations exhibit on the Peaceful Uses of Atomic Energy. The exhibits included not only those using isotopes, but also a thermonuclear section and a section containing two reactors. In order to handle both routine and possible emergency situations, HASL issued detailed health and safety regulations and obtained information about each exhibit by means of a questionnaire. Actual operation consisted of a preopening survey, daily health and safety surveys and reports during the exhibit, and surveillance during the clean-up phase. Routine operations consisted of the disposal of radioactive wastes in the form of solids, aqueous, and airborne material, the issuance and reading of film badges and pocket chambers, the installation of fixed gamma monitors, and the installation of fire protection equipment. Close attention to health and safety before, during, and after the conference contributed to the lack of overexposure or other incidents. —T.S.E.

Autogenous Recovery of Marrow Function. E. D. Thomas,* E. C. Herman, J. H. Cannon, O. D. Sahler, J. W. Ferrebee, H. E. M. Kay, and M. Constantoulakis. Arch. Int. Med. 107:395 (March) 1961. (*The Mary Imogene Bassett Hospital, Cooperstown, N. Y.)

A female infant with acute leukemia was treated with a tissue dose of 864 r of whole-body irradiation. The dose was equivalent to a midline air dose of 1,082 r given at the rate of 36.1 r per hour. The elapsed time was 41 hours, and the treatment time was 30 hours. The patient was isolated and given supportive therapy, antibiotics, and platelet transfusion. Multiple infusions of fetal hemopoietic tissue and one adult bone marrow infusion were given without evidence of a successful marrow transplant. Evidence of autogenous marrow recovery appeared after 29 days. This suggests that in infants, after exposure of 300 to 1,000 r, a regeneration of marrow may be expected, provided the patient is kept in good condition and the timing of the exposure is similar to that referred to above. —W.D.N.

Limitations on Space Flight due to Cosmic Radiations: Newly Discovered Radiations Dictate Vehicle Design and Orbit of Future Manned Space Flights. H. J. Curtis.* Science 133:312 (Feb. 3) 1961. (*Biology Department, Brookhaven National Laboratory, Upton, N. Y.)

A factor which may severely limit man's operation in space is the presence there of various ionizing radiations. Below the lower limit of the Van Allen belts, that is up to about 1,000 miles, there is apparently no serious radiation hazard. It seems impractical to shield a rocket sufficiently to allow a man to remain in the inner Van Allen belt for more than about an hour. It should be possible for man to go through this belt rapidly without serious harm. Shielding for the outer Van Allen belt would have to be heavy to allow a stay of more than a few hours. Primary cosmic radiation is not a serious hazard even for exposures of a few weeks' duration. —W.D.N.

Some Physical and Physiological Factors Controlling the Fate of Inhaled Substances—I. Deposition. P. E. Morrow.* Health Physics 2:366 (May) 1960. (*Department of Radiation Biology, School of Medicine and Dentistry, University of Rochester, Rochester, N. Y.)

Some of the important physical and physiological factors which determine dust deposition are brought together. Particles are deposited in the respiratory tract largely by sedimentation ($> 0.1 < 50\,\mu$), impaction ($> 0.5 < 50\,\mu$), and Brownian motion (> 0.002 [?] $< 0.5\,\mu$). Sedimentation and impaction cause dust deposition in the nasopharynx and tracheobronchial tree, while Brownian motion results in deposition in bronchioles and alveoli. Increasing the respiratory frequency decreases deposition, while increasing the tidal volume increases deposition. Sedimentation and inertia are highly significant in toxicological studies, especially with soluble or absorbable dusts. Brownian motion is not significant when dust is poorly soluble and submicronic. —W.D.N.

The Influence of Radioactivity and Lung Burden on the Pulmonary Clearance Rate of Barium Sulfate. H. Cember,* J. A. Watson, and M. E. Novak. Am. Indust. Hyg. A. J. 22:27 (Feb.) 1961. (*University of Cincinnati, College of Medicine, Cincinnati 19, Ohio)

Three groups of rats were given intratracheal injections of barium sulfate (mean size 3.6 μ) at dose levels of 23.3, 233, and 2,330 μg. Three

parallel groups were given similar doses that contained 1 mc (millicurie) of S^{35} per dose. The rats were killed at varying times over a 21-day period, and the barium sulfate left in the lung was determined. The lung clearance in all cases was determined to be exponential in time. The largest dose, 2,330 μg, which had the added S^{35} activity had a deep respiratory tract retention half-time of 27½ days, while all the other doses, both radioactive and nonradioactive, had a clearance half-time of about 10 days. Clearance of the nonradioactive particles from the lungs was independent of the lung burden in the range 23.3 to 2,330 μg. —W.D.N.

Chemical Antidotes for Radiation Injury. J. Doull.* Arch. Environ. Health 2:284 (March) 1961. (*University of Chicago, USAF Radiation Laboratory)

The antidotes for radiation injury developed to date are of two general types: (1) those which protect by reducing tissue oxygen and (2) those, such as 2-aminoethylisothiourea (AET), whose radioprotective activities are possibly due to interactions with certain sulfhydryl-containing cellular constituents. Under optimal conditions, the dose to produce a specific injury may be increased from one and one-half to two times with most of the better radioprotective chemicals. The antidotes are all further limited by the necessity of administration before exposure to radiation and by their toxicity. Most of the effective radioprotective agents must be given at toxic or near-toxic dosage levels to achieve useful protective effects. The more effective agents are also much less effective against neutron exposures.

Our understanding of the processes of injury and recovery in irradiated animals has been greatly advanced during the last decade by the developments in therapy and prophylaxis of radiation injury. It is hoped that this increased understanding will result in the discovery of more effective and less toxic antidotes for radiation injury. —W.D.N.

Dermatology

Court Cases of Alleged Occupational Dermatitis. L. Schwartz.* Indust. Med. & Surg. 29:540 (Nov.) 1960. (*915 19th St., N. W., Washington 6, D. C.)

Cases of dermatitis that satisfy the classical diagnostic criteria of occupational dermatitis do not come before compensation boards or courts because these cases are not contested. The contested cases usually do not meet all the criteria for diagnosis of occupational dermatitis or have been decided to be of occupational origin but subsequently the patients fail to get well within a reasonable time (two or three months). Causes for perpetuation of dermatitis away from work include contact with irritants at home, an underlying diagnosis of atopic eczema, and malingering. Occupational contactants should not be blamed for causing diseases of unknown etiology, such as psoriasis, lichen planus, alopecia areata, and scleroderma. Physicians performing patch tests should take care to ascertain the chemical nature of patch test materials and to use nonirritating concentrations. Even so, patch tests are subject to many misinterpretations. Many of the faults of the present system of judging compensation cases can be corrected by having a panel of disinterested medical experts hired and paid by the compensation board. —M.M.K.

Cement Dermatitis and Sensitization to Cobalt. J. D. Geiser,* J. P. Jeanneret, and J. Delacretaz. Dermatologica 121:1 (Jan.) 1960. (*Clinique universitaire de dermato-vénéréologie de Lousanne, Lousanne, Switzerland)

Patch tests with several of the constituents of cement were carried out on 53 patients with cement dermatitis as well as on controls. Patch tests were performed with concentrations listed in the "Yearbook of Dermatology and Syphilology, 1957-1958," were left on for 24 hours, and were read by conventional standards. The majority of the patch tests gave negative results, but a 2% solution of cobalt chloride gave positive results in 51% of patients with cement dermatitis and in 14% of patients with contact dermatitis due to other causes. Of the group of 53 patients with cement dermatitis 92% reacted to potassium dichromate. The authors believe that cobalt sensitivity as well as chrome sensitivity may play a role in the pathogenesis of cement dermatitis. —M.M.K.

Some Effects of Soap on the Skin. F. R. Bettley.* Brit. M. J. 1:1675 (June 4) 1960. (*Middlesex Hospital, London)

Although soap has an antibacterial action, the removal of bacteria by washing or detergency is more important. The most effective cleanser is an alkaline anionic detergent, and ordinary soap fulfills this requirement. The normal acid reaction of the skin is changed toward alkaline by hand washing, especially when repeated, but the role of soap in causing or aggravating a dermatitis is frequently difficult to evaluate. Hypersensitivity to soap is rare, and patch tests with soap solutions elicit positive reactions because soaps are primary irritants. Soap owes some of its irritancy to its fatty acid content and to its degreasing effect, but the most important factor may be an increase in skin permeability, which allows alkali and fatty acids to reach the Malpighian cells. Soap should not be used in the formulation of oil-resistant barrier creams. —M.M.K.

Cross-sensitization Between Neomycin, Bacitracin, Kanamycin and Framycetin. V. Pirila* and S. Rouhunkoski. Dermatologica 121:335 (Dec.) 1960. (*Department of Dermatology and Syphilology, Helsinki University, Helsinki, Finland)

Hypersensitivity to neomycin has been increasing in recent years but is still not particularly high, considering the amount used. To investigate the cross reactivity between neomycin and other antibiotics, 50 patients with neomycin sensitivity

were patch tested with neomycin, bacitracin, kanamycin, and streptomycin. Forty-four of the neomycin-sensitive patients reacted to bacitracin, and 28 reacted to kanamycin. Reactions to streptomycin were rare. Patch test studies were made with other antibiotics derived from Streptomyces strains, but only framycetin gave a high percentage of cross-reaction with neomycin. The cross-sensitivity between neomycin, kanamycin, and framycetin may be explained by a common neamine ring with two primary amino groups.

—M.M.K.

Ringworm Infection in a Cucumber Greenhouse. J. Alsop* and A. P. Prior. Brit. M. J. 1:1081 (April 15) 1961. (*Alcester, England)

Microsporum gypseum, a widely occurring soil fungus, was responsible for an outbreak of ringworm of the glabrous skin among 17 greenhouse workers. Secondary cases occurred, spread by contact.

—M.M.K.

Clinical Toxicology

Erosion of the Teeth Due to Sulphuric Acid in the Battery Industry. D. Malcolm and E. Paul. Brit. J. Indust. Med. 18:63 (Jan.) 1961.

In the plant described in which batteries were manufactured, exposure to sulfuric acid mists occurred in the forming and charging processes. The forming process consists of immersing lead plates in dilute sulfuric acid in a manner to give positive and negative poles. Direct current is passed through the circuit, and the reaction "forms" the plates. Small gas bubbles are evolved, and they carry acid into the air. The amount of sulfuric acid in the atmosphere in the forming department varied from 3.0 mg to 16.6 mg per cubic meter of air. The charging process consists of filling finished batteries with acid and charging them with direct current. The amount of sulfuric acid in the air varied from less than 0.8 mg to 2.5 mg per cubic meter of air.

A dental survey was made of the men (160) in the charging and forming departments, and the dental findings were compared with those from men in other departments, in which exposure to acid mists did not occur. Teeth affected by exposure to acid mist have typical characteristics, and invariably involved were the central and lateral teeth (upper and lower) on their labial surfaces. Initially, etching of the incisal third of the tooth crown occurs, followed by a loss of tooth substance beginning at the mesioincisal angle of the central incisors. The exposed surface may be highly polished, and a slight degree of anterior open bite is established. As the lesion progresses, more enamel is lost and dentine shows through the thinned enamel. Eventually, the crown is lost; however, erosion seems to stop completely when the lip level is reached. No pain or sensitivity is experienced by the men, and there was no evidence of damage to the soft tissues. The degree of oral hygiene practiced had no obvious effect on the process. The severity was influenced directly by the length of the exposure; however, a few men appeared to be immune. There appeared to be no relationship between the decayed, missing, and filled rate and the degree of erosion. The configuration of the lips when slightly parted was significant in that men with markedly short lips showed gross erosion.

The differential diagnoses between erosion from industrial and nonindustrial causes are discussed. Methods for reducing the concentration of acid in the air as well as other preventive measures are discussed. Excellent photographs of the dental lesions are presented.

—L.H.M.

Symptomatic Pulmonary Disease in Arc Welders. E. Friede* and D. O. Rachow. Ann. Int. Med. 54: 121 (Jan.) 1961. (*993 Delaware Ave., Buffalo, N. Y.)

Cases of disease in arc welders with manifestations including chest x-ray changes, fever, malaise, cough, pulmonary fibrosis, emphysema, decreased oxygen saturation of the blood, and secondary polycythemia have been reported by a number of observers in the past.

This paper is a case report of a 40-year-old man who worked steadily for 10 years prior to admission to the hospital as an arc welder. On admission to the hospital he complained of weakness, shortness of breath, and ankle edema. He was cyanotic and in severe respiratory distress. A chest x-ray film suggested the presence of pulmonary fibrosis and severe emphysema. Pulmonary function studies demonstrated a loss of ventilatory function and marked obstruction. The electrocardiogram was consistent with right ventricular hypertrophy and strain. The hemoglobin was 26.1 gm, red blood cell count 7,500,000, hematocrit 72%, and arterial oxygen saturation 46%. Treatment included digitalization, mercurial diuretics, and acetazolamide. After clinical improvement occurred, a specimen for biopsy from a lung was obtained. The histopathologic changes consisted of thickening of the alveolar septa due to fibrosis, presence of macrophages loaded with an iron-containing pigment in the alveoli and in the interstitial tissue, and thickening of the walls of the vessels.

Analyses were made of welding rods and samples of the environment in which the patient worked. The concentration of free silica in the smoke and fumes was 16%, while the iron oxide concentration was 37 mg per cubic meter of air. The authors believed that the disease was produced by the prolonged inhalation of fumes that contained a combination of free silica and iron oxide.

—L.H.M.

Evaluation of Trisodium Calcium Diethylenetriaminepentaacetate in Iron Storage Disease. J. L. Fahey,* C. E. Rath, J. V. Princiotto, I. B. Brick,

and M. Rubin. J. Lab. & Clin Med. 57:436 (March) 1961. (*Department of Medicine, Georgetown University School of Medicine, Washington, D. C.)

Trisodium calcium diethylenetriaminepentaacetate (DTPA) was administered parenterally intramuscularly and intravenously to five patients who had iron storage disease. Two control subjects did not show any increase in the amount of iron excreted in the urine, but three patients with hemochromatosis excreted iron in amounts up to 109 mg over a 24-hour period. The magnitude of iron excretion appeared to correlate with estimates of the amounts of iron stored in the various patients. No significant effects on the hemogram, urinalyses, BUN, or serum calcium were noted; however, the prothrombin times were prolonged slightly. It is believed that DTPA is distributed via the circulatory system to sites of iron storage, iron substituted for calcium in the chelate, and the iron chelate excreted by the kidneys. DTPA administration resulted in far greater iron excretion than that obtained with comparable doses of edathamil (EDTA). Since DTPA has a greater affinity for strontium and cobalt than EDTA, it is suggested that DTPA may be more effective in removing these metals from the body. Other workers have shown that 35% of a dose of monomeric thorium-234 administered intravenously is eliminated, and yttrium-90 is rapidly excreted after DTPA therapy. Because of these observations, it is thought that this agent may prove to be useful in the removal of radioisotopes that are acquired accidentally. Further studies are in progress to determine the efficacy of long-term therapy with DTPA in cases of hemochromatosis. —L.H.M.

Medical Care Administration

The Tragedy of Unused Medical Knowledge. L. Baumgartner.* New M. Materia 3:47 (May) 1961. (*Office of the Commissioner of Health, New York City)

It is not enough to provide more money for hospitals, for union pension funds, for the aged, or for handicapped persons; but, in order for all Americans to share more promptly and more equitably in the benefits of advancing medical knowledge, it will be necessary to change not only the way medical care is paid for but also the way that health and medical services are organized and delivered.

Arrangements that were quite suitable to accomplish health objectives of an era when only relatively simple preventive and therapeutic measures were available are quite unsuitable for translating into action quickly the fruits of research and for dealing with chronic illness and disability, which are today's leading health problems.

All the splintering, the fragmentation, in the way personal health services are made available means that people must go from doctor to doctor and from office to clinic or hospital with one test and treatment here, another there. We need to find a way to simplify the delivery of health services to the family. The leadership of the U. S. Public Health Service and professional groups is needed. President Kennedy's program should include an attack on the problem of fragmentation, duplication, waste, and inefficiency. Our big foundations should tackle this problem. We are using 19th century machinery to do a 20th century medical-care job. —A.B.

Geriatrics, Medicine, and Rehabilitation. L. Friedfeld.* J.A.M.A. 175:141 (Feb. 19) 1961. (*Beth Israel Hospital, New York, N. Y.)

A geriatric clinic in a general hospital has developed health services and counseling with comprehensive diagnostic and treatment services to help the elderly to live effectively within their own community as long as this is their choice.

Major problems of the aged include suitable housing and living arrangements, physical and emotional health, satisfying social relationships, participation in community life, economic security, education, recreation, meaningful activities, rehabilitation services, religious opportunities, and welfare services. It must be realized that needs of individuals differ, and these needs change with time and circumstance. Counseling and planning should start long before retirement to ease the adjustment.

Individuals are helped to live comfortably and productively within their own group. High costs for institutional construction and maintenance are avoided since 95% of people past 65 years of age can be helped to maintain themselves satisfactorily in their own homes. —A.B.

Environmental Physiology

Upper Safe Limits of Industrial Thermal Stress. W. F. Ashe.* Proceedings of the Thirteenth International Congress on Occupational Health, 1960, p. 835. (*Ohio State University College of Medicine, Columbus, Ohio)

The upper limit of heat stress to which the industrial worker can be exposed regularly and safely each day may be defined as those conditions under which he is capable, physiologically, of remaining in thermal and electrolyte balance. For healthy acclimatized young males limiting levels for dry and wet bulb temperatures were established in wartime studies. Thermally equivalent conditions (°F) under which such subjects complete a standard four-hour work task with relatively little heat strain ("relatively easy" conditions) are 92° dry bulb (DB) and 92° wet bulb (WB), 110° DB and 90.5° WB, 120° DB and 89° WB. Plotted with DB and WB as coordinates, the limiting values form a straight line. Data from laboratories in other countries obtained on healthy acclimatized subjects of various races show good agreement. To allow for variations in heat tolerance related to age, sex, acclimatization, clothing,

work period, and state of health, the author suggests the safe upper limit for **all** industrial workers should be represented by a line parallel to the one defined above but 7° F lower both in DB and WB. Field studies in textile mills in India and clinical reports of heat cases support the practical application of such a standard. —D.M.

Experimental Researches on Urinary Elimination of 17-Ketosteroids and on Eosinophilia During Body Adjustment to High Temperatures. C. Berdan* and M. Pafnote. Proceedings of the Thirteenth International Congress on Occupational Health, 1960, p. 845. (*Institute of Hygiene and Public Health, Rumania)

Six resting subjects 25 to 30 years old were exposed 4 hours daily for 14 days to 40° C ambient temperature at 20% to 30% relative humidity. Urinary elimination of 17-ketosteroids (17-K) 4, 12, and 24 hours after each exposure was measured and compared with output under basal conditions at 22° to 24° C. Eosinophil counts were made before and after each four-hour exposure. Initially, 17-K output was increased up to 75% above control values, the maximum output being observed in the four-hour specimen on the first day, with rapid falling off up to six days and a more gradual decline toward control levels by the 14th day. Eosinopenia as a measure of adrenal cortical activation followed a similar pattern. The authors suggest that output of "'mineral corticoids" (i.e., aldosterone) may follow a similar time course. It is concluded that urinary output of 17-K and eosinopenia are useful indices of adaptation to heat. —D.M.

Recent Developments in Understanding of Effects of Exposure to Heat. H. S. Belding,* T. F. Hatch, B. A. Hertig, and M. L. Riedesel. Proceedings of the Thirteenth International Congress on Occupational Health, 1960, p. 839. (*Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pa.)

Failure to adapt to heat leads to one of three major disorders: (1) heat exhaustion from circulatory insufficiency to vital areas; (2) heat stroke from failure of central control mechanisms, or (3) heat cramps from excessive drain on body salt. Observations over a four-year period in a Chicago steel plant reveal the accident rate to be twice as high in summer as in winter; a causal relation between environmental heat and accident rate is not thereby established, but further studies are clearly indicated. Following heat exposure, skin temperature, heart rate, and sweat rate return toward preexposure levels more promptly than rectal temperature; taken alone, the former may thus be misleading as indices of full recovery from heat. Despite assertions by others to the contrary, fall in sweat rate on change from a hot to a cool environment follows the change in skin temperature more closely than the change in core temperature. After acclimatization, the threshold skin temperature at the onset of sweating is 1.4° C lower than before acclimatization. Under a given heat load, therefore, the acclimatized subject can maintain the required rate of evaporation with less circulatory strain than before acclimatization, by virtue of the larger core-to-surface gradient. —D.M.

Physiological Aspects of Shiftwork. F. H. Bonjer.* Proceedings of the Thirteenth International Congress on Occupational Health, 1960, p. 848. (*Netherlands Institute for Preventive Medicine, Leyden, Netherlands)

Percentage of errors and productivity do not differ significantly during different shifts (day vs. night), nor is there any apparent deterioration in work capacity in workers during a continuous night shift lasting up to 13 weeks. Experimentally, diurnal patterns of body temperature differ significantly in subjects on night shifts compared with those on day shifts. On day work body temperature reaches a maximum at about 7:30 p. m. and a minimum at 3:30 a. m. during sleep. On night work the curve is flattened, the fall being less at night and the rise less during the day. This is regarded as a useful adaptation which is acquired in as short a period as one to three days and depends on two factors: the reversed pattern of metabolic heat production and the diurnal alteration in environmental temperature. —D.M.

Mental Health

A Prescription for Executive Mental Health. W. C. Menninger.* Advanced Management, pp. 16-17, Sept., 1960. (*The Menninger Foundation, Topeka, Kan.)

The author points out that there has been an increasing acceptance of periodic health examinations for industrial personnel and recommends that companies consider providing regular emotional check-ups for their executives. The value of this examination would be to give an actual basis for evaluating the executive's mental health in order to make recommendations and also to give the executive food for thought. Menninger indicates the questions which he would be concerned with in this emotional check-up. They include points such as the following: Does the executive lose his temper? Does he get jittery? Does anxiety impede his functioning? Can he accept frustration? Does he get satisfaction in constructive creative giving of himself? Concerning a prescription for improvement of mental health, it is suggested that the executive spend some time thinking about his life goals, priorities, ambitions and aspirations. He should also examine his sense of values. A need of vacations and hobbies is stressed. "To summarize, my prescription for the executive is to know himself better in terms of his emotional health and his relations with other people." —G.C.T.

About the Authors

► MARCUS M. KEY, M.D., is Assistant Chief of the Dermatology Section, Occupational Health Field Headquarters, Public Health Service, Cincinnati, Ohio. His college studies at Columbia University, were interrupted by war service in the U. S. Army Air Force. After separation with the rank of captain, he returned to Columbia to graduate with B.A. and M.D. degrees.

Dr. Key interned at the U. S. Public Health Service Hospital, Boston, Mass., and then attended Harvard School of Public Health, as an Atomic Energy Commission Fellow in Industrial Medicine. Thereafter he trained for four years in dermatology at Columbia Presbyterian Medical Center in New York, and at Cincinnati General Hospital. He joined the Public Health Services' Occupational Health Field Headquarters at Cincinnati in 1956. He is a diplomate of the American Board of Dermatology and an instructor in dermatology and industrial medicine at the University of Cincinnati.

Dr. Key is senior author of the article in this issue, "Patch Testing in Dermatitis from the Newer Resins." Associated with him are the following co-authors:

VERNON B. PERONE, Industrial Hygienist of the Dermatology Section at the Occupational Health Field Headquarters in Cincinnati. Mr. Perone entered the U. S. Public Health Service in June, 1941, and except for one year at the National Institutes of Health, and three and one-half years in the U. S. Navy, has served continuously in the Division of Occupational Health.

Mr. Perone is a co-author of 14 publications relating to occupational health. He is a member of the American Conference of Governmental Industrial Hygienists, American Public Health Association, Ohio Public Health Association, American Association for the Advancement of Science, and American Association of Medical Technologists.

DONALD J. BIRMINGHAM, M.D., Chief of Dermatology at the Occupational Health Field Headquarters, Cincinnati, Ohio. Dr. Birmingham attended John Carroll University in Cleveland, and St. Louis University School of Medicine. After an internship at St. Elizabeth Hospital, Youngstown, Ohio, he joined the U. S. Public Health Service in 1941 and was assigned to general medical and surgical service in Boston. Five years later he was assigned under a Rockefeller Foundation Fellowship to the New York Post-Graduate Medical School, Skin and Cancer Unit, where he spent three years in the study of diseases of the skin.

Dr. Birmingham is a Diplomate of the American Board of Dermatology. He is Associate Clinical Professor of Dermatology, University of Cincinnati College of Medicine; Assistant Clinical Professor of Industrial Medicine, Kettering Laboratory; Lecturer on Dermatology and Syphilology, Skin and Cancer Unit, New York University-Bellevue Medical Center; Lecturer on Industrial Dermatology, Johns Hopkins University School of Hygiene and Public Health; and Attending Dermatologist, Cincinnati General Hospital.

► JAMES A. KNIGHT, M.D., entered medicine by way of the ministry. After receiving the A.B. degree from Wofford College, Spartanburg, S. C., he attended the Divinity School of Duke University. Graduation with the B.D. degree was followed by active duty in the U. S. Navy as chaplain of a hospital ship in the Pacific Theatre. He received the M.D. degree from Vanderbilt University School of Medicine in 1952; interned for two years at Grady Memorial Hospital, Atlanta, Ga., and Duke University Hospital; and then served for a year as Medical Director, Fortier Plant, American Cyanamid Company, New Orleans, La.

Dr. Knight trained in psychiatry at Charity Hospital (Tulane University Service), New Orleans, La., and then became an instructor in psychiatry on the Tulane faculty. He moved to Houston in 1958 to

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About the Authors

become a member of the faculty of the Department of Psychiatry, Baylor University College of Medicine. He is now an assistant professor of psychiatry, assistant dean of the College of Medicine, and Consultant Psychiatrist to Humble Oil & Refining Company. He is the senior author of the series of articles starting in this issue on "Mental Health in Industrial Practice."

► VALIANT C. BAIRD, M.D., co-author of the series of articles, "Mental Health in Industrial Practice," is Medical Director, Humble Oil & Refining Company, Houston, Texas.

Dr. Baird holds the B.S. and M.D. degrees from Tulane University, New Orleans, La. He is widely active in the affairs of his community, industrial medicine, and medicine in general. He is a member of the faculties of the University of Texas Postgraduate School and of Baylor University College of Medicine, Houston, Texas. He has for some years been a member of the Council on Industrial Health, A.M.A. He is a former member of the Board of Directors of IMA and is certified in occupational medicine by the American Board of Preventive Medicine.

► JOHN G. LIONE, M.D., is a native of New York. He received the A.B. degree from Columbia University in 1941 and the M.D. degree from Long Island College of Medicine in 1944. After a rotating internship at New York City Hospital, he went on active duty with the United States Army Air Corps. In 1947, he joined the Esso Medical Department as Senior Plant Physician at the Bayonne (N.J.) Refinery. This service was interrupted in 1951 with recall to active duty with the Air Force during the Korean War. He returned to the Bayonne Refinery in 1952, where he resumed his duties as Senior Plant Physician. From 1954 to 1957, he had assignments at the Bayway Refinery in Linden, N. J., and at the Baton Rouge (La.) Refinery. He transferred to the Baton Rouge Refinery as Assistant Medical Director in 1957.

Dr. Lione is active in the United States Air Force Reserves as a Senior Flight Surgeon with the rank of Colonel. In 1959 he was appointed Assistant Professor of Industrial and Occupational Medicine, Department of Preventive Medicine and Public Health, Tulane University School of Medicine.

Dr. Lione is certified in occupational medicine by the American Board of Preventive Medicine. He is a Fellow of both the Industrial Medical Association and the American College of Preventive Medicine. He is a member of the American Academy of Occupational Medicine and the Aerospace Medical Association. He is the author of the article in this issue, "Convulsive Disorders in a Working Population."

► JOHN J. BLOOMFIELD, formerly Assistant Chief of the Division of Industrial Hygiene of the United States Public Health Service, and later Regional Consultant in Industrial Hygiene in Latin America for the Institute of Inter-American Affairs, began his career in industrial hygiene in 1920.

After graduating as an engineer from the University of New Hampshire in 1920, Mr. Bloomfield immediately joined the U. S. Bureau of Mines and in 1923 transferred to the U. S. Public Health Service. He participated in almost all of the early investigations of industrial health hazards, including those of the dusty trades, the radium dial industry, the hatmaking industry and many others. In 1936, he became closely connected with the administration of Federal funds granted for State and local industrial hygiene services.

In January, 1947, Mr. Bloomfield began his assignment as special consultant in industrial hygiene to the Institute of Inter-American Affairs in Latin America and was stationed in Lima, Peru from 1950 to 1960. He is now located in Santiago, Chile. He has lectured in many universities in the United States and South America, has published numerous articles and bulletins for magazines and technical journals and has contributed to several books dealing with industrial hygiene. In 1958, he received the Cummings Memorial Award from the American Industrial Hygiene Association, in recognition of his contribution to industrial hygiene both in the United States and abroad. That same year, he was given a special citation by the American Conference of Governmental Industrial Hygienists.

In 1960, Mr. Bloomfield completed a three-month assignment in the Far East, studying industrial health problems in Korea, the Philippines and Formosa. His article in this issue "The Present Status of Occupational Health in Korea, the Philippines and Taiwan," is based on this study.

► ELSTON L. BELKNAP, M.D., is author of the review article in this issue, "Modern Trends in Treatment of Lead Poisoning." DR. BELKNAP graduated in medicine from the Johns Hopkins University School of Medicine in 1923. After an internship at Johns Hopkins Hospital he served a residency in internal medicine at Henry Ford Hospital, Detroit, Mich. He then started a practice in internal medicine in Milwaukee, Wis.

Early in his career as an internist, DR. BELKNAP developed a side interest in the lead poisoning problem at a storage battery plant. This interest has continued and grown, not only in terms of lead poisoning, but to include as well the whole field of industrial intoxications. As time has gone by, he has become primarily a consultant in occupational diseases and secondarily a practitioner of internal medicine.

DR. BELKNAP was a member of the Committee on Lead Poisoning of the American Public Health Association which prepared the report, "Occupational Lead Exposure and Lead Poisoning." He has been Consultant Medical Director, Globe-Union, Inc., Milwaukee, since 1930; Lecturer on Poisons of Industry for the University of Wisconsin Medical School since 1956; and Professor and Director, Department of Occupational and Environmental Medicine, Marquette University School of Medicine, since 1954. He is certified in internal medicine by the American Board of Internal Medicine, and in occupational medicine by the American Board of Preventive Medicine.

—EDITOR

People and Events

► JOHN J. THORPE, M.D., joined the staff of the Medical Department of Standard Oil Company (N.J.) in New York City on July 1 as Assistant Medical Director, it was announced by RALPH F. SCHNEIDER, M.D., Medical Director. In addition to activities in the field of internal medicine, DR. THORPE'S administrative duties will include service as Medical Department contact for the Mediterranean, European and North African areas.

DR. THORPE received his medical degree from Cornell University Medical College in 1941. Following his internship, he was on active duty with the United States Army from 1942 to 1946. For the next three years he was Resident in Medicine and Research Assistant in Medicine (Cardiology) at New York Post-Graduate Hospital. He joined the Jersey Medical Department in 1949 and subsequently became Assistant Medical Director and then Associate Medical Director of Esso Standard Oil Company.

DR. THORPE is certified in internal medicine by the American Board of Internal Medicine, and in occupational medicine by the American Board of Preventive Medicine. He is a Fellow of the American College of Physicians and holds an appointment as Assistant Professor of Clinical Medicine at the Post-Graduate Medical School, New York University Medical Center.

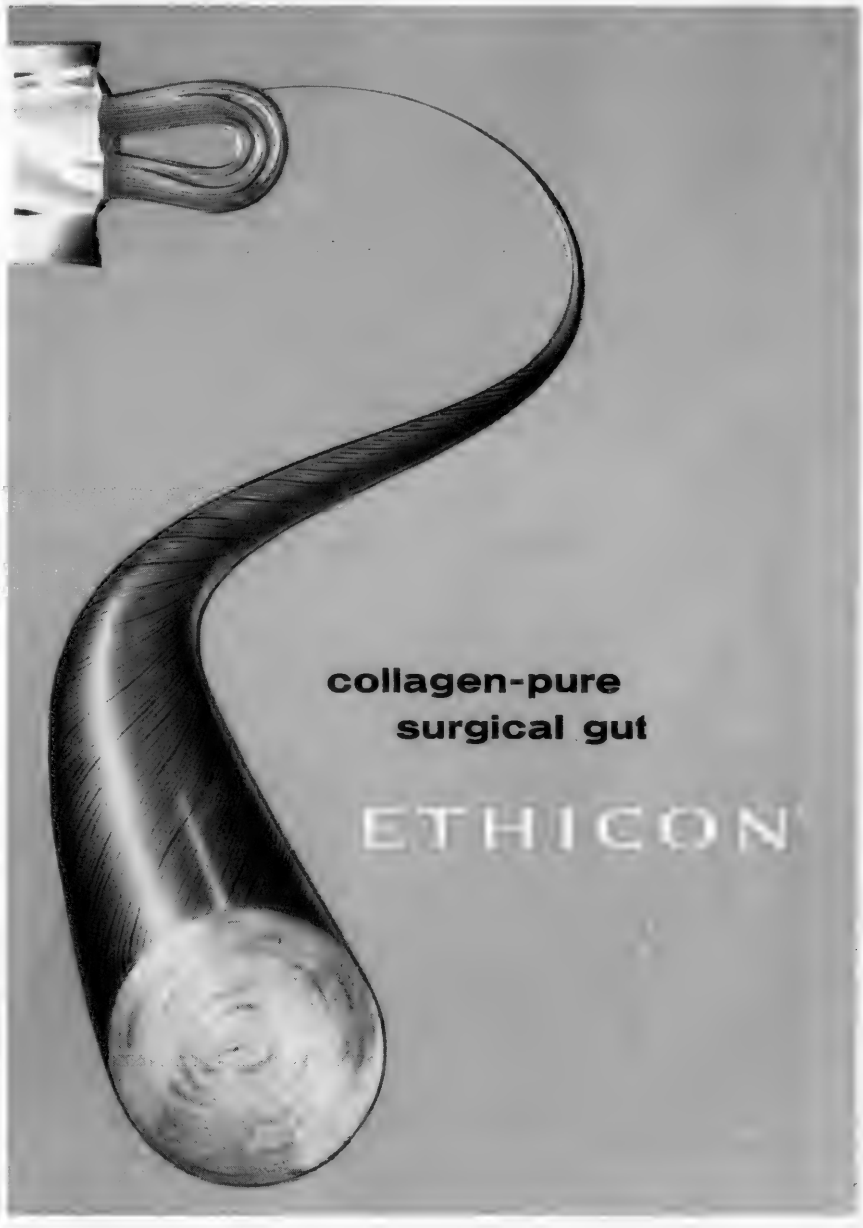
► GERALD E. BLANCHARD, M.D., has been appointed Chief Physician at the Wayne Assembly Plant of the Ford Motor Company. He has been with Ford in the Rouge Medical Service since February, 1960.

DR. BLANCHARD was graduated from the University of Toledo (Ohio) with a major in chemistry and received his M.D. degree from the St. Louis University School of Medicine in 1946. He interned at Mercy Hospital, Toledo, and served one year as a resident in surgery.

After spending three years in the military service, DR. BLANCHARD was discharged with the rank of Major. For the next three years he was a resident in surgery at the Mt. Carmel Mercy Hospital in Detroit. Prior to joining Ford, he was in private practice for five years, serving part of that time as Plant Physician for the Perfection Steel Body Company at Galion, Ohio.

► GROSVENOR G. ROBERTS, M.D., has been appointed Medical Director at Western Electric Company's Kansas City Works, which is nearing completion in Lee's Summit, Mo. DR. ROBERTS will work with a staff of about eight assistants, including four or five nurses, several part-time physicians and an x-ray technician. Eventually, the new plant will employ about 5,000 persons to manufacture telephone equipment and electronic devices such as transistors.

Since November, 1960, DR.



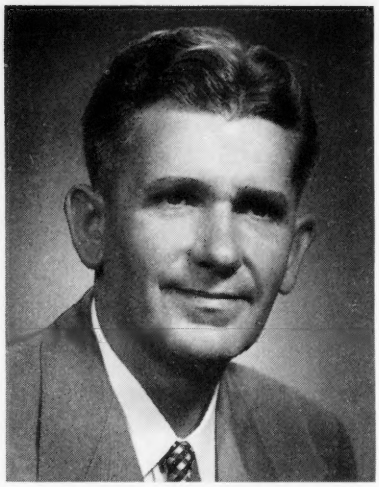
People and Events

ROBERTS has been at the company's pilot plant in Grandview, Mo., while engaged in the private practice of surgery in Kansas City. He received his medical degree from the University of Kansas in 1951.

► EDWARD J. ZAIK, M.D., assumed the position of Medical Director of the Pacific Telephone and Telegraph Company, Los Angeles Area, on August 1, succeeding JEROME W. SHILLING, M.D., who has retired.

DR. ZAIK will be responsible for medical services in the central Medical Department with a total staff of 37 persons. He will also coordinate and supervise the work of local medical consultants in outlying localities in the Los Angeles area.

DR. ZAIK is a native of Michigan. He did his undergraduate work at Wayne University in Detroit and received his medical degree from the same institution in 1939. He joined the Michigan Bell Telephone Company in 1942 and was transferred to the Pacific Telephone and



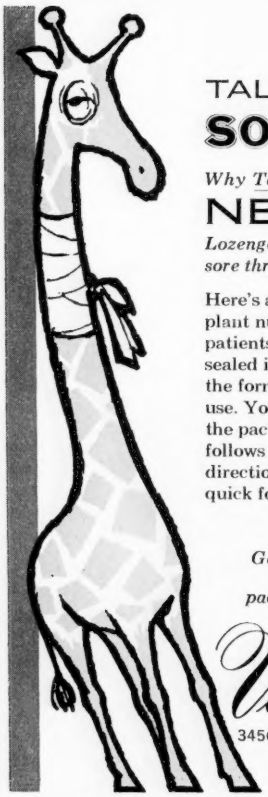
Edward J. Zaik, M.D.

Telegraph Company, Southern California, as Assistant Medical Officer in 1945. He was appointed Associate Medical Director of the Pacific Telephone and Telegraph, Los Angeles, Area in 1958.

Among his academic appointments, DR. ZAIK is Associate Clinical Professor in Preventive Medicine and Public Health at the University of California, Los Angeles. He is a Fellow of the American College of Preventive Medicine and is certified in occupational medicine by the American Board of Preventive Medicine. He is a Fellow of the Industrial Medical Association and a past-president of the Western Industrial Medical Association. He is also a past-president of the Section on Industrial Medicine and Surgery of the Los Angeles County Medical Society.

DR. SHILLING was President of the Industrial Medical Association during the 1957-58 term. He is a past-president of the Western Industrial Medical Association and of the Section on Industrial Medicine and Surgery of the Los Angeles County Medical Society. He is certified in occupational medicine by the American Board of Preventive Medicine.

► WILLIAM J. BURKE, M.D., has joined the medical staff at International Business Machines Research Center in Yorktown Heights, N.Y. He assumed his duties as physician on July 1. For the past



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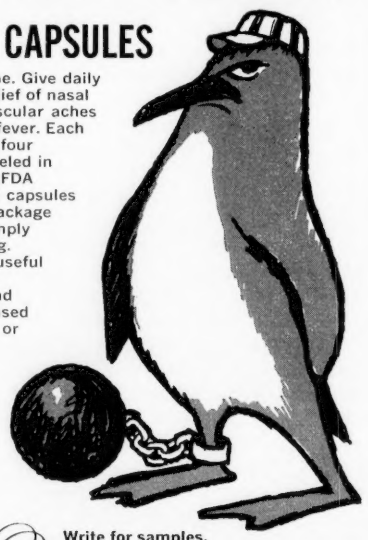

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six years he has been Assistant Consultant in Toxicology for the Food, Machinery and Chemical Corporation.

DR. BURKE received his M.D. degree from the University of Buffalo School of Medicine in 1947 and served as a rotating internship at Buffalo General Hospital. From 1948 to 1950 he was Assistant Resident Physician in Internal Medicine at the same hospital. He served with the U.S. Navy as a lieutenant in the medical corps from 1950-1952, then spent the next three years in private practice.

DR. BURKE holds appointments as Instructor in Medicine and as Associate in the Department of Legal Medicine at the University of Buffalo. He is also Clinical Assistant in Medicine and Assistant Biochemist at Buffalo General Hospital. He is certified in internal medicine by the American Board of Internal Medicine.

► THEODORE J. SMITH, M.D., who has been with Standard Oil Company (Indiana), now the American Oil Company, since 1929, is taking early retirement and will become Health Officer for the City of Hammond, Ind.

DR. SMITH received his B.S. degree in 1924 from the University of Wisconsin, and his M.D. degree from Rush Medical College in 1927. He served his internship at Henrotin Hospital and Chicago Polyclinic. He is a member of the American Medical Association and a Fellow of the Industrial Medical Association.

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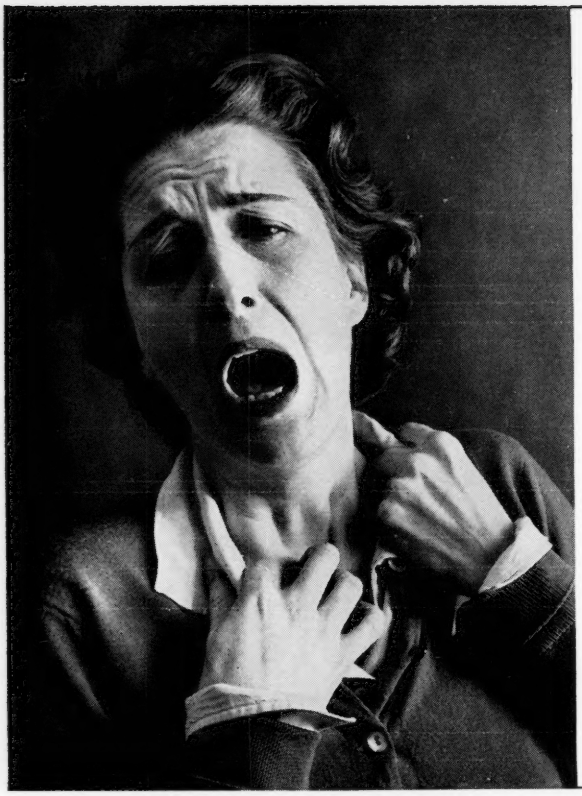

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*Glaser, J.: Ann. Allergy **18**:510 (May) 1960.

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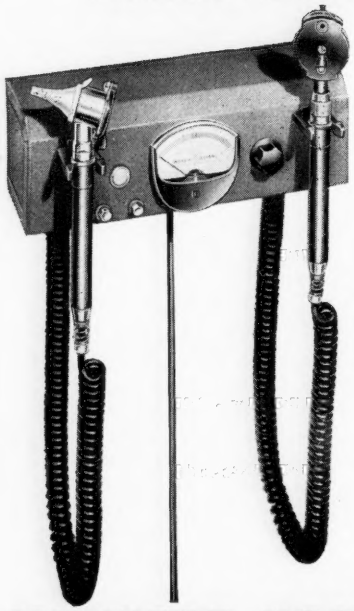
WELCH-ALLYN No. 745 WALL TRANSFORMER UNIT $60.00



(No instruments included) Just lift the instrument. It's lighted and ready to use. Handles for two instruments. Saves frequent changing of heads. Maximum brilliance of illumination without overloading lamps is assured with rheostat and easily read volt meter. Lamps last longer. Binding cord provided for cord tips. No battery replacements. Light weight handles. Eight foot cord on each handle—wide scope of use without trading or extension cords. Complete line of Welch-Allyn diagnostic sets and transilluminators, in stock.

MIDWEST HOSPITAL & SURGICAL SUPPLY CO.
7209 SOUTH HALSTED ST. **CHICAGO 21, ILL.**